DECEMBER 28, 1953

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION

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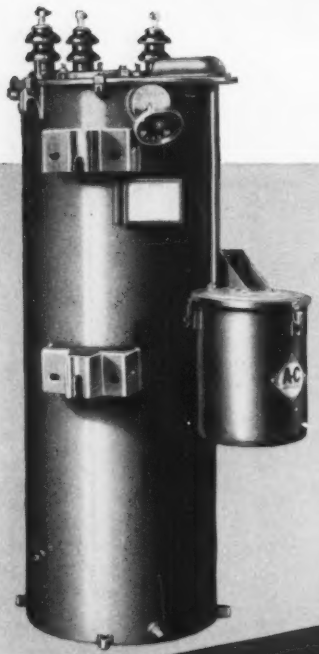
Looking over 1953's shoulder at progress in . . .

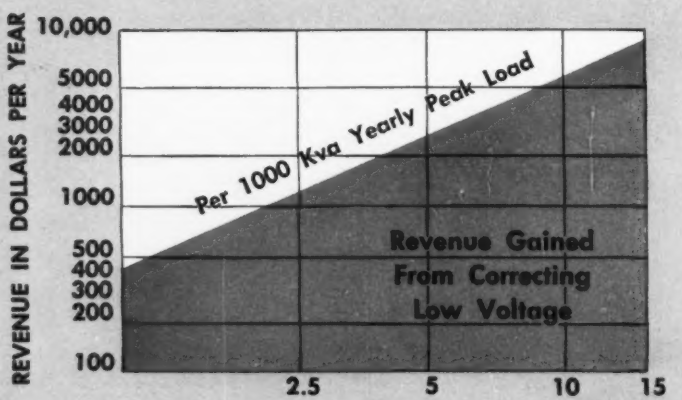
Transmission . . . Regulations . . . Appliances . . .
Management . . . Generation . . . Financing . . .
Distribution . . . Industrial Applications . . .

and ahead for . . .

1954

HOW SMALL INVESTMENT ...Increases Revenue





Assuming: 90% Power Factor; 40% Load Factor; 50% Lighting Load; Energy Charge: 3¢/kwhr; Average Lighting Load Drop — 70% of Peak Load Drop; You can interpolate directly for other loads.

ALLIS-CHALMERS 5/8% STEP VOLTAGE REGULATORS

The chart above shows it pays in increased revenue to get accurate voltage by using Allis-Chalmers distribution regulators. Initial cost is low. And operating costs are low too because you get reliable regulation with an absolute minimum of maintenance.

Get Years of Satisfactory Operation

...the *Quick-Break* mechanism has been field tested for twenty years in thousands of applications — it can withstand five million operations.

. . . long-life contacts are made of arc-resisting material in generous dimensions . . . will last for 40 years normal operation.

. . . unit construction makes top-quality workmanship possible because all connections can be made and inspected before tanking.

. . . installation and maintenance are easy — careful engineering eliminates necessity for highly trained operators.

Get More Facts

Your nearby Allis-Chalmers district office can supply you with complete information on distribution regulators. Call them or write Allis-Chalmers, Milwaukee 1, Wis.

A-4184

ALLIS-CHALMERS

Bundles for America

Americans, so the talk goes, like their information wrapped in a nice, neat bundle. One of the neatest, as far as they're concerned, is the year-end report that gives business, industry, institutions—and even individuals—an opportunity to evaluate the accomplishments of the previous 12 months. Such a report also provides a convenient jumping off place for speculation on what the new year will bring.

Hail to Thee . . . This twofold opportunity is provided in this issue of Electrical World. From pages 73 to 91 is presented our first full-blown year-end report and forecast. It is the product of the cooperative efforts of our staff of specialists. All of them took a day or two off from their ordinary editorial duties to give you a picture of what has happened and is likely to happen in the particular spheres of the electric industry with which they are most familiar.

Hunt 'n Peck . . . From among the 2,200 editorial pages published by this magazine during 1953, the editors have assembled the significant events of the year. They have put them together by topical classifications and added footnotes to make it easier for subscribers to get additional information from their files.

Read 'n Remember . . . This time in looking backward might be as well spent by our readers as it was by the editors. One does not always remember what one has read. And often the articles that have not appeared to be significant when published turn out to be the most significant as time goes by. This is especially true when one has changed jobs in the meantime.

To disagree with these articles and predictions is the right of every reader. But to consider the accomplishments and to conjure how these accomplishments can be surpassed in the next 365 days is, we do not believe, a matter of choice on our readers' part. We're convinced that this is an obligation, which if not fulfilled, can be detrimental to the industry as well as themselves.

Electrical World

Published for 79 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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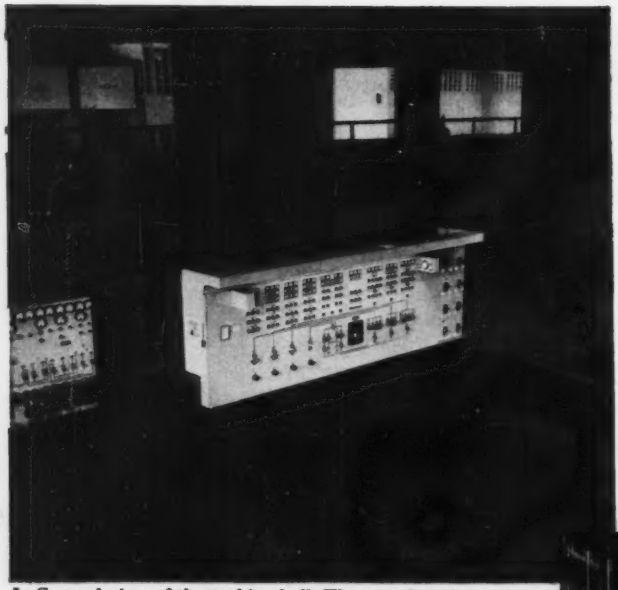
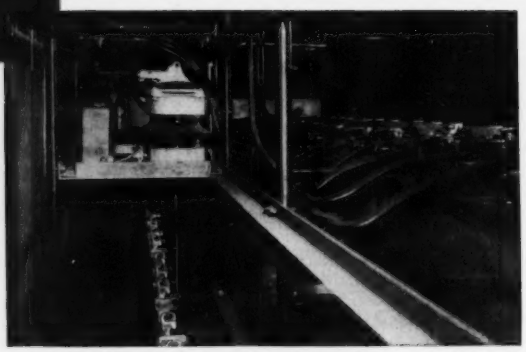


1. General view of the turbine hall. The new distribution control board is in the center, the old control board is at the left, and the old switchgear is above it on the balcony.

2. Cable connections at main and auxiliary station service breakers. Surge protective equipment for station service bus is at left.

HAGERSTOWN SPECIFICATION:

no service interruption during installation . . . or after



CABLE SPECIFICATION: *Okolite-Okoprene*

Specifications for the expansion and modernization of the Municipal Electric Light Plant of the City of Hagerstown, Maryland, were made unusually complex by the absence of auxiliary power sources. Interruption of service was impracticable and therefore considerable engineering study and planning by Albert C. Wood Associates, consulting engineers, were required to solve the design and construction problems involved.

Installation of the new 5,000-KW, 13.2-KV steam turbine generator, it was determined, would overstress the old open framework and concrete cell switchgear. Therefore, new 2.4-KV and 13.2-KV metalclad switchgear was installed, and arrangements were made to tie-in the new switchgear by paralleling circuits. The new equipment was energized a circuit at a time.

All material specified for the installation was selected only after extensive evaluation of reliability and suitability. *Okolite-Okoprene was chosen for all cable requirements of the project.* Okolite-Okoprene was used on all switchgear, control board, generator and exciter equipment as well as bus tie transformers and sub-stations.

Recognized throughout the power industry for outstanding dependability and long service life, Okolite-Okoprene exceeds industry standards for quality and durability. Write for Bulletin EW1075 for complete information on the outstanding advantages of Okolite-Okoprene rubber-insulated cables for high voltage use. The Okonite Company, Passaic, New Jersey.

OKONITE SINCE 1878 *insulated cables*

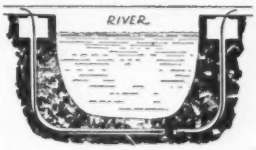
2008

10,000 FEET OF CONDUIT RODDED IN 8 HOURS!

Pick-up and Leader fittings meeting

Right, Electroline Steel Rodding Equipment feeds easily around the bends.

Below, Leader locked in Pick-up for either push or pull.



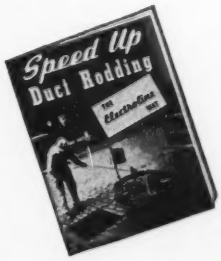
EASY DOES IT!—It's all in a day's work with Electroline Steel Duct-Rodding Equipment rodding 10,000 feet of conduit!

Light in weight, easily handled and stored, low upkeep: these are a few of the advantages utility men know to be true. But even bigger, more important advantages are—

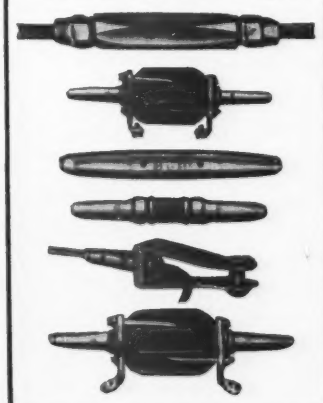
- *Savings in the cost of labor*—for example, where it formerly took two gangs from one to two weeks on a given job, one gang, *in one-half hour*, has completed the same job—using Electroline Duct-Rodding Equipment.
- *Savings in original cost*—you get long life—double that of other types—when you buy Electroline Duct-Rodding Equipment. Add to that this fact: this equipment costs just about half as much for equivalent capacity! *There's true economy.*
- *Savings in Total Investment*—fewer sets are required because of the speed with which a job is completed and the equipment moved to other locations.

Speed up installation, reduce your costs; start now to use Electroline Duct-Rodding Equipment. Available for 3", 3½" or 4" Duct.

We've got a 4-page brochure which describes and illustrates more completely how this equipment can benefit you. We'll gladly send you a copy. Write us.



OTHER *Electroline* PRODUCTS



Electroline Company

4121 South La Salle St., Chicago 9, Ill.
In Canada: POWERLITE DEVICES, LTD., TORONTO

In Your Distribution Substations

WHAT DOES IT TAKE

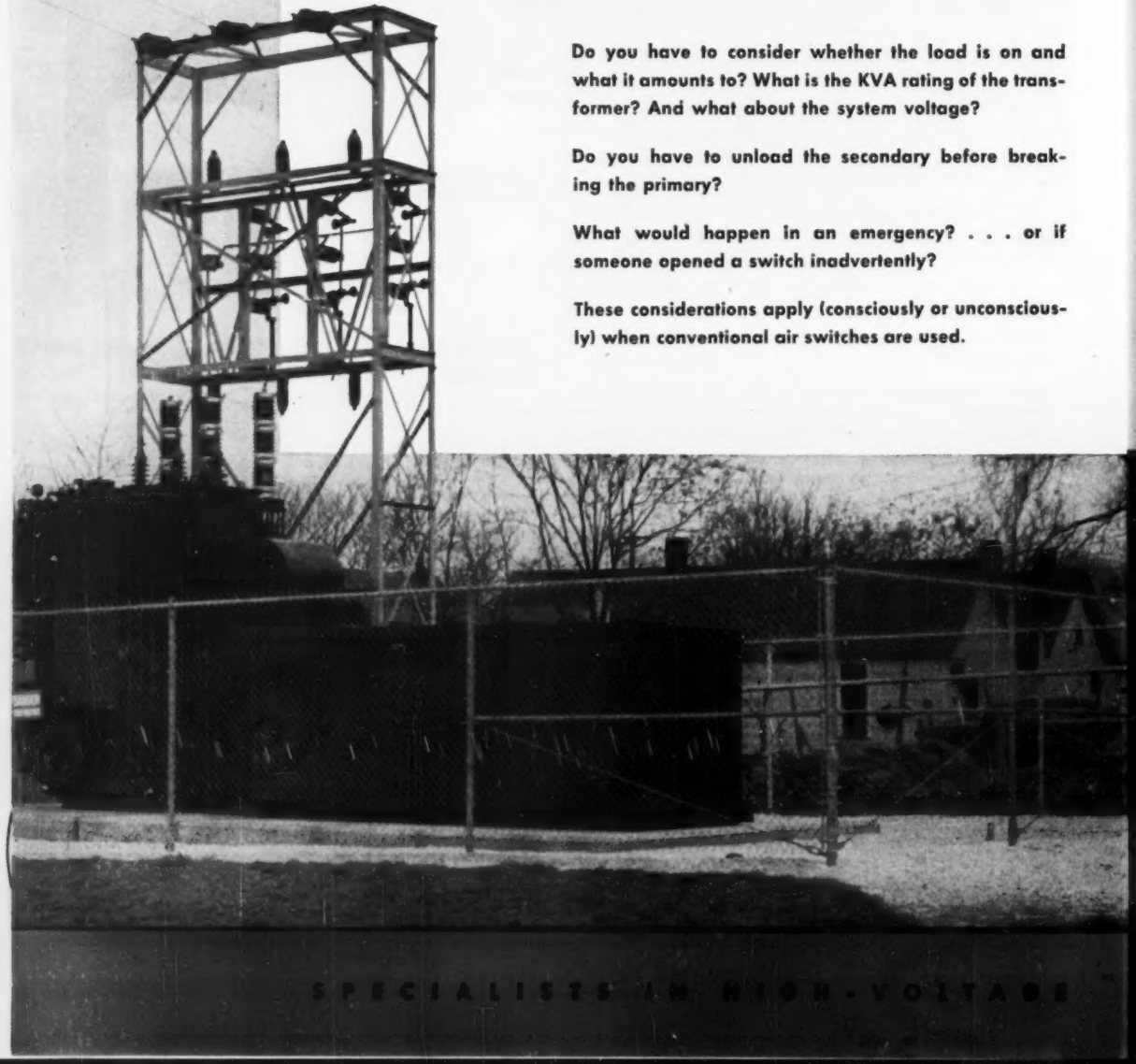
to Switch the Primary?

Do you have to consider whether the load is on and what it amounts to? What is the KVA rating of the transformer? And what about the system voltage?

Do you have to unload the secondary before breaking the primary?

What would happen in an emergency? . . . or if someone opened a switch inadvertently?

These considerations apply (consciously or unconsciously) when conventional air switches are used.



SPECIALISTS IN HIGH-VOLTAGE

The S&C LOAD INTERRUPTER takes nothing but a pull on the handle

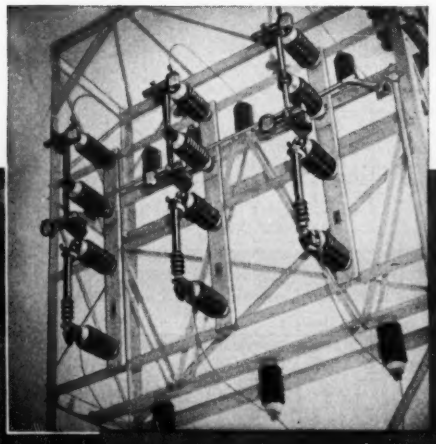
● The S&C Load Interrupter (Alduti Type) can break the primary circuit of a distribution substation any time under any condition (except short circuit) without endangering men or equipment. Switching cannot lead to dangerous phase-to-phase or phase-to-ground faults.

● When you break the magnetizing current, the break is positive—clean—decisive. (You don't have to "dog" it as a primary.) You are completely independent of wind velocity and wind direction.

● Then too you can break the magnetizing current of a high-KVA transformer that cannot possibly be broken with a conventional air switch.

● Under emergency conditions—or for protection against inadvertent operation—you can interrupt the entire load current of the substation. Thus you have two ways to drop the load—on either primary or secondary side.

Do you have these operating advantages at your substations?



Inset shows a close-up of S&C Load Interrupters in service on the primary of a typical distribution substation.

Interrupters bring new concepts of operating convenience, and new thinking in system design. We will gladly send you this booklet containing detailed information about them.

S&C ELECTRIC COMPANY

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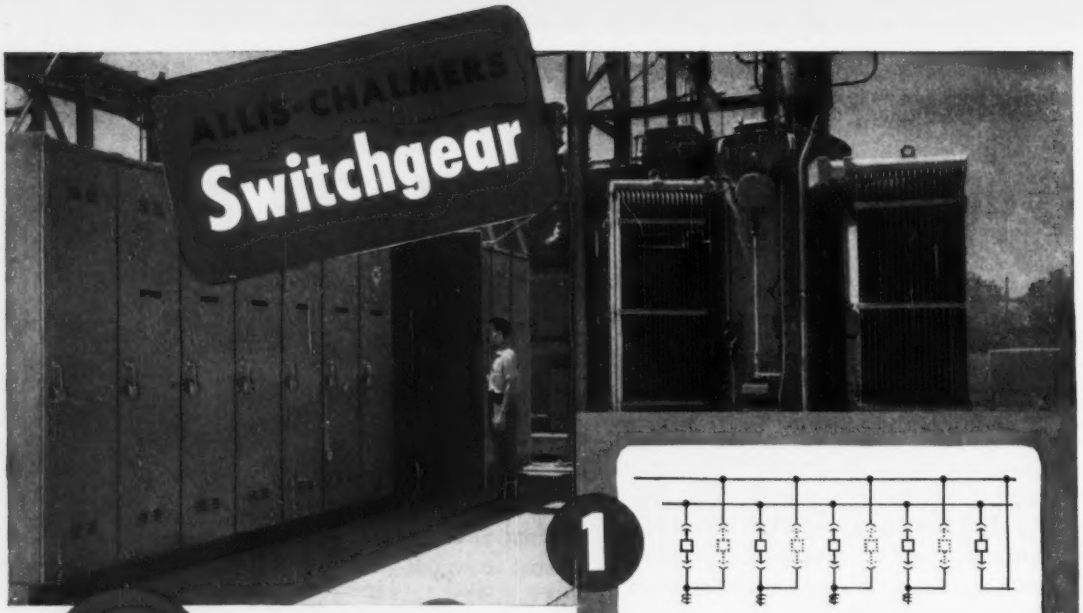
CIRCUIT INTERRUPTION



4 WAYS to Guard Against Power Interruption

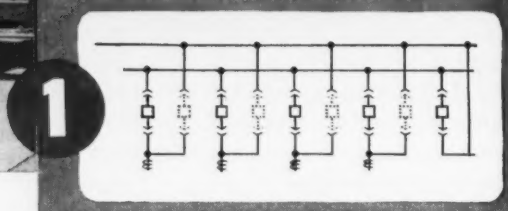
Here are a few of the many different circuit arrangements Allis-Chalmers can provide. All are designed to assure continuity of service. Each one is specially suited for specific situations.

With Allis-Chalmers switchgear, all these circuit schemes have one advantage in common. Each arrangement shown can be built into standard units of Allis-Chalmers metal-clad switchgear without adding extra cubicles. This economy and simplicity, plus the obvious space savings, make Allis-Chalmers equipment especially attractive.

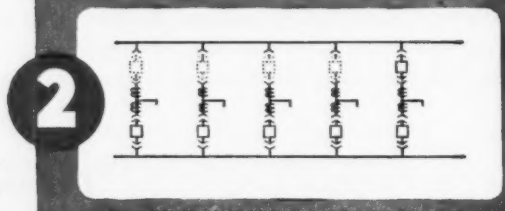
Which Arrangement is Best? A study of your problem is needed to answer this question. Any one of these arrangements may be best for your plant. Or maybe an entirely different scheme is needed. In any case, Allis-Chalmers engineers can help you work out the best scheme for you... one that provides ✓ economy, ✓ simplicity, ✓ space saving, and ✓ uninterrupted service.

For complete information, call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

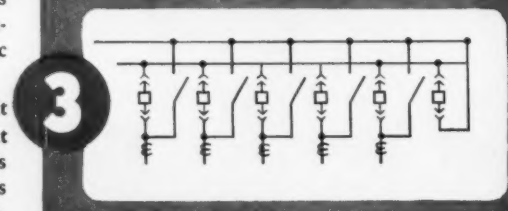
A-4165



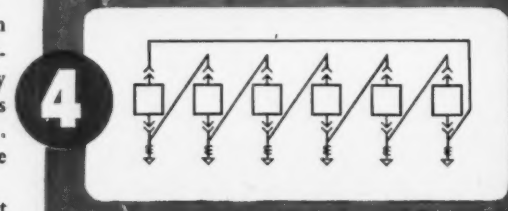
DOUBLE BUS in line



DOUBLE BUS back-to-back



TRANSFER BUS and disconnect



RING BUS

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

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we thank you...

Fully aware of the important part our customers have played in helping G&W to become the standard of comparison in the industry, we—as individuals and as an organization—want to express our thanks to you in person.

Next time you're in Chicago, why not drop in for a visit? Meet some of our people . . . see our new facilities, our modern equipment, our exacting manufacturing methods, our rigid inspection . . . all geared to provide specialized cable accessories of quality and performance.

We're only a 20-minute cab ride from your hotel or loop headquarters. Visit us soon . . . we want to know you as more than a signature on a letter, or a voice on the phone!

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7780 Dante Avenue (Corner 78th & Kenwood) Chicago 19, Illinois

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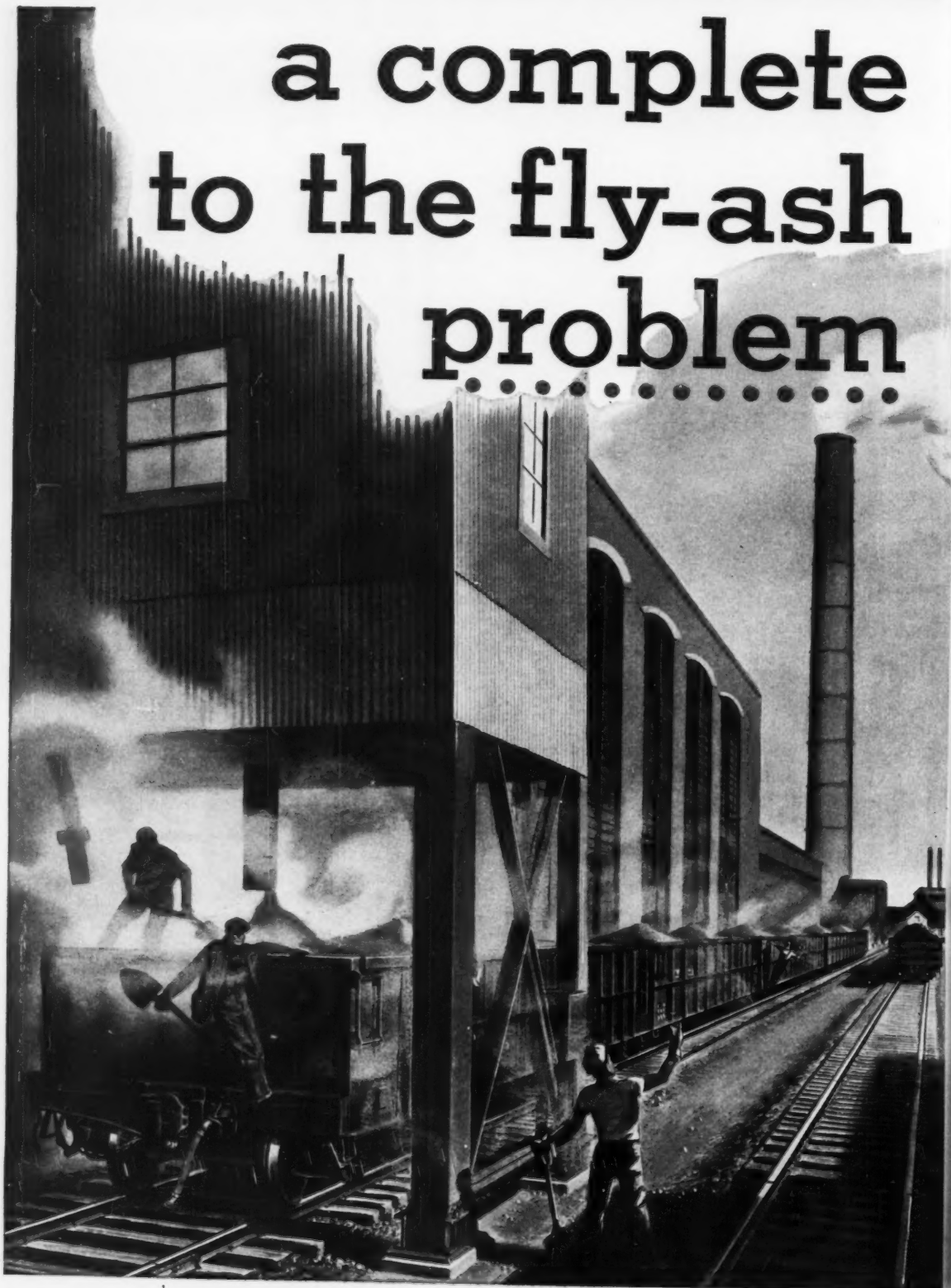
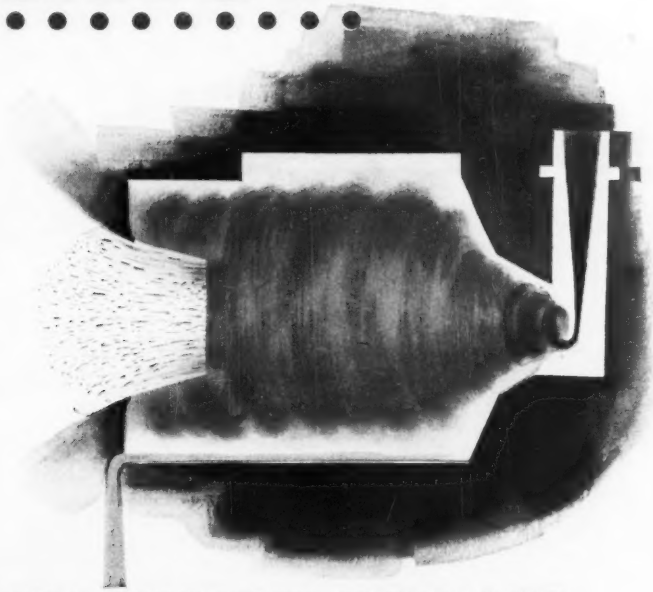
a complete to the fly-ash problem



solution



THE CYCLONE FURNACE

Power-plant operators have been plagued for years by the expense and nuisance caused by fly ash and the community relations problems involved in its disposal. They have spent millions to keep fly-ash from reaching the atmosphere and, yearly, spend many additional millions in handling thousands of tons of troublesome, dusty fly-ash and paying for its removal.

Today, the Cyclone Furnace completely solves this major problem:

1. Most of the ash produced by burning the coal is changed to molten slag in the Cyclone Furnace. This slag is easy to handle, has many uses, and often can be sold, representing an asset rather than a liability. Because there is so little ash in the gas leaving a Cyclone-Furnace-fired boiler, it is often possible to eliminate precipitators. Where precipitators are used, they can be greatly simplified, because the designer can think in terms of pounds—instead of tons—of ash per hour.

2. Where local conditions may require use of precipitators in conjunction with the Cyclone Furnace, there is no need for handling the fly-ash collected. It can, with simple equipment, be blown back into the Cyclone Furnace to be melted down into slag.

Through this one feature alone—by completely solving the fly ash problem—the Cyclone Furnace greatly improves plant operations. But many other advantages, such as increased availability through elimination of outage-causing equipment, simplified operation through use of crushed coal, reduced cost of upkeep, and higher thermal efficiency, also are obtained with Cyclone Furnaces.

Many B&W Cyclone-Furnace-fired boilers are in operation, in various parts of the country, burning many different kinds of coal. The operating requirements and the design conditions for these boilers include most of the variations that can be expected in utility practice. We will be pleased to discuss with you the many ways in which Cyclone Furnace firing can be of benefit to you.

CYCLONE FURNACE BOILER UNITS IN OPERATION

Owner & Station	Number of Boilers	Kilowatt Rating
COMMONWEALTH EDISON		
Calumet	1	18,000
Fisk	2	150,000
Ridgeland	4	300,000
PUBLIC SERVICE CO. OF NORTHERN ILLINOIS		
Waukegan	1	40,000
Waukegan	1	110,000
Joliet	2	107,000
NORTHERN INDIANA PUBLIC SERVICE CO.		
Michigan City	3	105,000
DOW CHEMICAL CO.		
West Side Plant	1	30,000
South Side Plant	2	60,000
WISCONSIN POWER & LIGHT		
Sheboygan	1	60,000
BABCOCK & WILCOX		
Barberton	1	—
JERSEY CENTRAL POWER & LIGHT		
South Amboy	1	62,500
TOTAL UNITS IN OPERATION	20	1,042,500

BABCOCK & WILCOX
BOILER DIVISION

G-610

NEW

You need it! Send for free copy today!

United States Rubber Company, the only electrical wire and cable producer to grow its own natural rubber and to manufacture its own plastics and synthetic rubber, makes a complete line of electrical wires and cables for every industrial and domestic application. Just published is the 1953 "U.S." Catalog, essential for men who specify, install or maintain electrical wire and cable. Send for your free copy to address below. Here are the catalog chapter headings:

1. U. S. Royal Portable Cords and Cables
2. U. S. Railroad Wires and Cables
3. U. S. Power Cables
4. U. S. Control and Signal Cables
5. U. S. Building Wires and Cables
6. U. S. Bare and Weatherproof Wires
7. U. S. Flexible Cords and Cord Sets
8. U. S. Telephone Wires and Cables
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"U.S." Research perfects it...

"U.S." Production builds it

U.S. RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE AND CABLE DEPARTMENT • Rockefeller Center, New York 20, N. Y.

SANGAMO . . .

the Demand Registers with service experience

Economical operation of demand meters depends on how often the registers must be given necessary maintenance.

Sangamo's New Service Manual recommends that Sangamo Demand Registers be subjected to only a *minimum* of preventive maintenance. Field service records show that these registers operate satisfactorily for from 4 to 12 years.

HERE ARE THE REASONS Type JH and LCH Registers can give such performance . . .

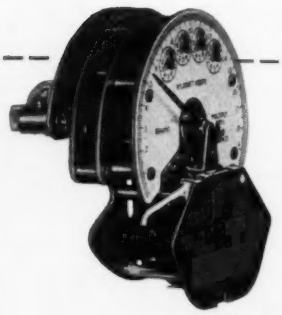
1. The exclusive Sangamo-built slow speed, high torque motor with porous, lubricant-saturated bronze bearings. Result: *No motor trouble.*

2. Hardened steel pivots and porous lubricant-saturated bronze bearings. Result: *Friction does not develop in timing gearing.*

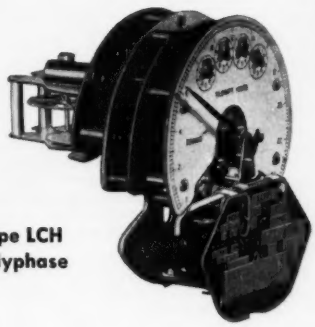
3. Jewelled bearings in resetting mechanism. Result: *Makes resetting positive and friction-free.*

These design features assure economical operation and complete satisfaction.

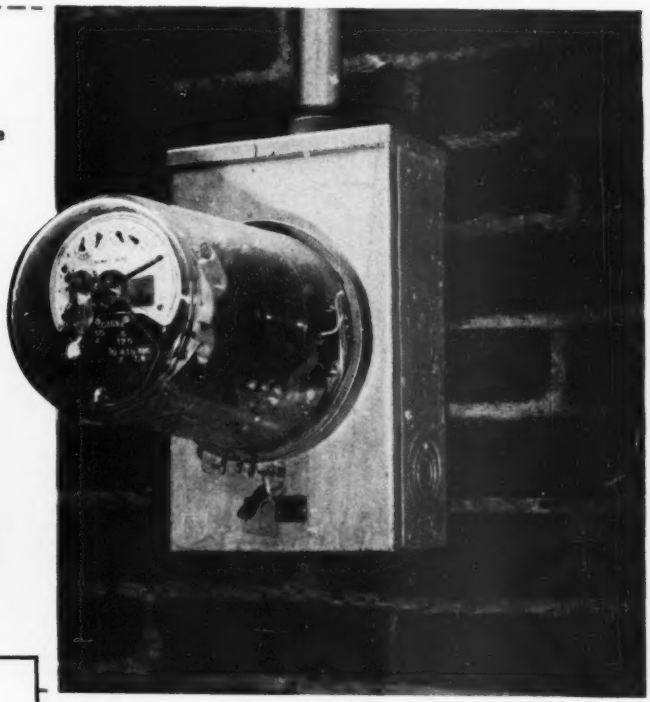
Write for your copies of Descriptive Bulletins No. 311 and 321, and for Service Manual No. 390.



Type JH
Singlephase

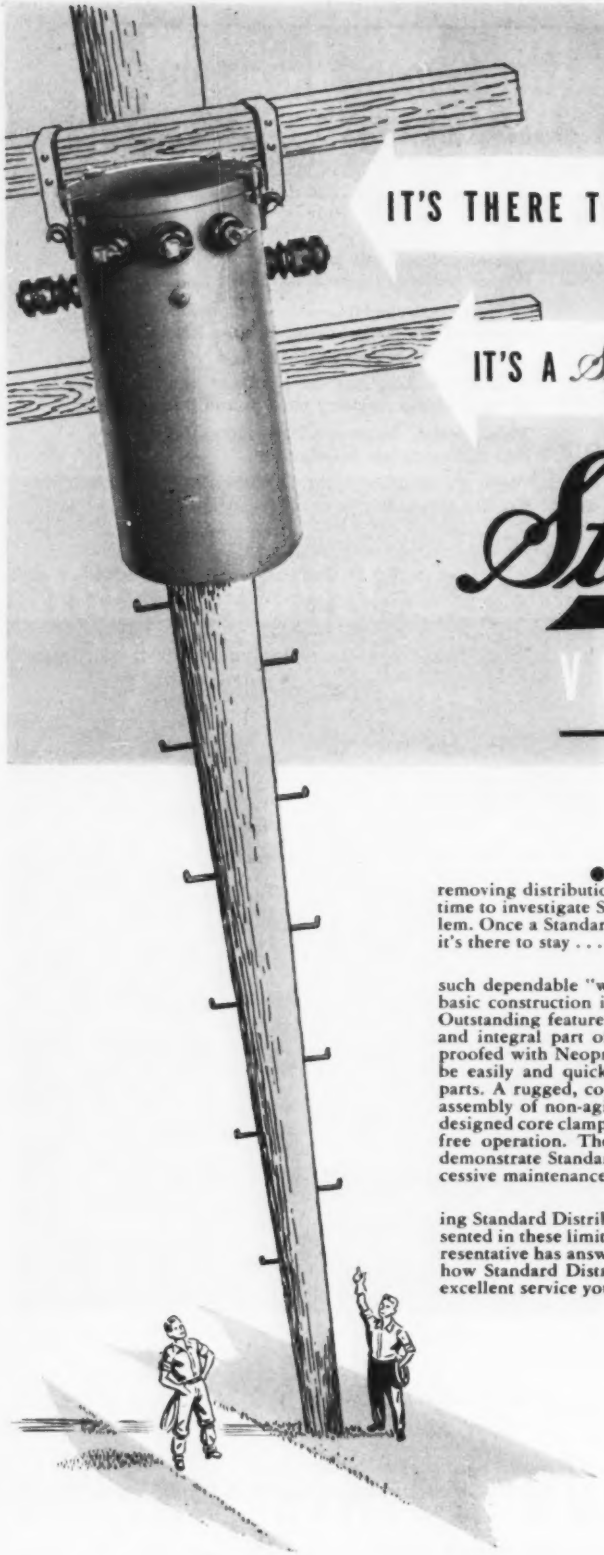


Type LCH
Polyphase



SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Only Measured Facts are Known Facts



IT'S THERE TO STAY...

IT'S A *Standard* TRADE MARK TRANSFORMER

Standard

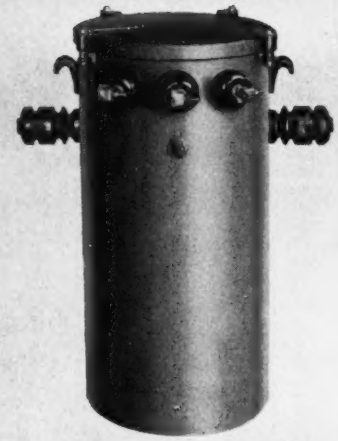
TRADE MARK (R)

VITAL PART OF _____

● If transformer failure keeps your linemen busy removing distribution transformers and installing new ones, then it's time to investigate Standard Transformers as a solution to your problem. Once a Standard Distribution Transformer is installed on a line, it's there to stay . . . silently channeling current to your customers.

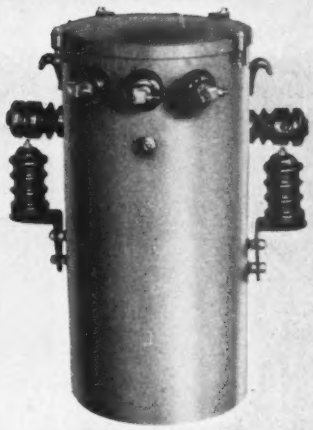
What makes Standard Distribution Transformers such dependable "watch dogs"? Close examination discloses sound, basic construction in full accordance with ASA and REA standards. Outstanding features set them apart from others as an indispensable and integral part of your distribution system. Covers are moisture-proofed with Neoprene gaskets which prevent oil leakage. They can be easily and quickly removed, allowing immediate access to vital parts. A rugged, copper-bearing steel tank houses the low-loss core assembly of non-aging, varnish-coated, silicon steel sheets. Specially designed core clamps hold core rigidly in place assuring quiet, trouble-free operation. These, plus numerous other construction features, demonstrate Standard Transformers to be helpful in solving your excessive maintenance problem.

Naturally, you want more information concerning Standard Distribution Transformers than that which we have presented in these limited words. Your nearby Standard Transformer representative has answers to your questions. Call him. Let him show you how Standard Distribution Transformers can help you maintain the excellent service your customers deserve.

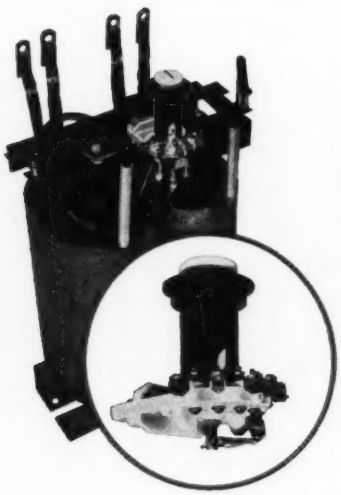


← Type A. OISC Conventional Distribution Transformer, 15 KVA, single phase, 60 cycle, with side wall mounted high voltage bushings. Standard construction for voltages 5 KV and sizes through 100 KVA.

→ Type CSP. OISC Distribution Transformer, 15 KVA, single phase, 60 cycle, with primary lightning arresters, internal fuses, low voltage circuit breaker and side wall mounted high voltage bushings. Standard construction for voltages 5 KV and less and sizes through 100 KVA.



TRANSFORMERS ARE A
YOUR DISTRIBUTION SYSTEM

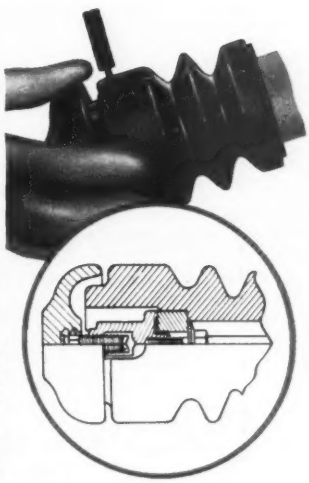


NEW TANK WALL BUSHINGS →

New bushings permit "flick-of-the-wrist" line insertion without tools. No live parts are exposed. Terminal compression stud keeps easy-to-grip, insulated porcelain cap from falling off when unscrewed to receive primary leads. Cables can be brought in from either side and held securely by pressure from the clamping shoe. Makes for faster, safer, easier installations.

← TAP CHANGER SWITCH

Standard's new Tap Changer Switch embodies a contact-making assembly with a brass wheel for positive contact. Normal settings are with 4-tap voltage section. 2½ % taps within 10 % range of normal rating. Standard supplies transformers with 4 taps above or below, or half above and half below as specified by the customer. This is available at no extra cost to you. Contact-making points are submerged in oil with the handle well above oil level.



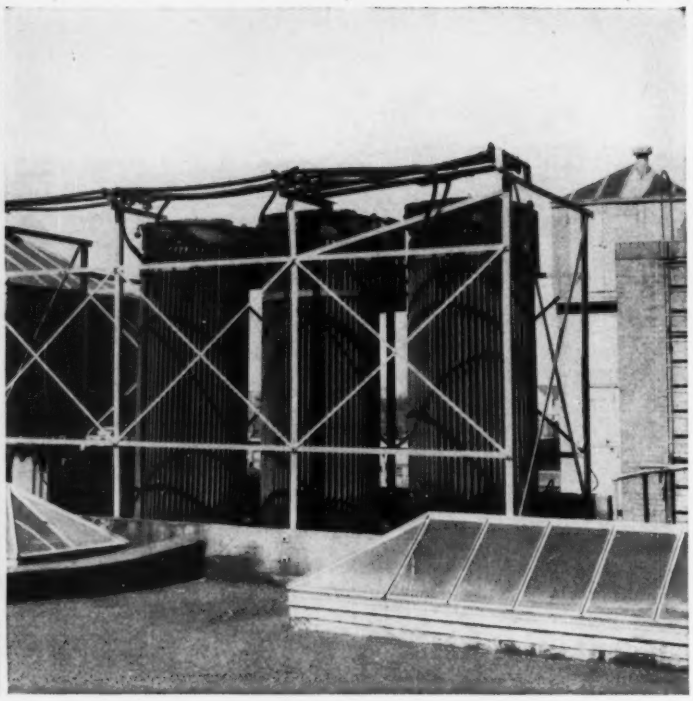
Standard

Trade Mark ®

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO
REPRESENTATIVES IN PRINCIPAL CITIES

So Much Depends Upon So Little



Make a quick guess, and figure how much money it would cost if your high voltage power distribution system failed. Quite a sizable amount, isn't it?

That's what we mean by "so much depends upon so little." Sure, comparatively speaking, power cable is only a small part of the total cost of the plant. But when a cable failure occurs, the price of the shutdown can far exceed what you'd pay for dependable Simplex-ANHYDREX XX High Voltage Feeder Cable.

Why gamble with power cable cost? For practically the same price as ordinary cable, Simplex-ANHYDREX XX Cable provides you with:

√Exceptional resistance to: Heat — Aging — Ozone — Oxidation.

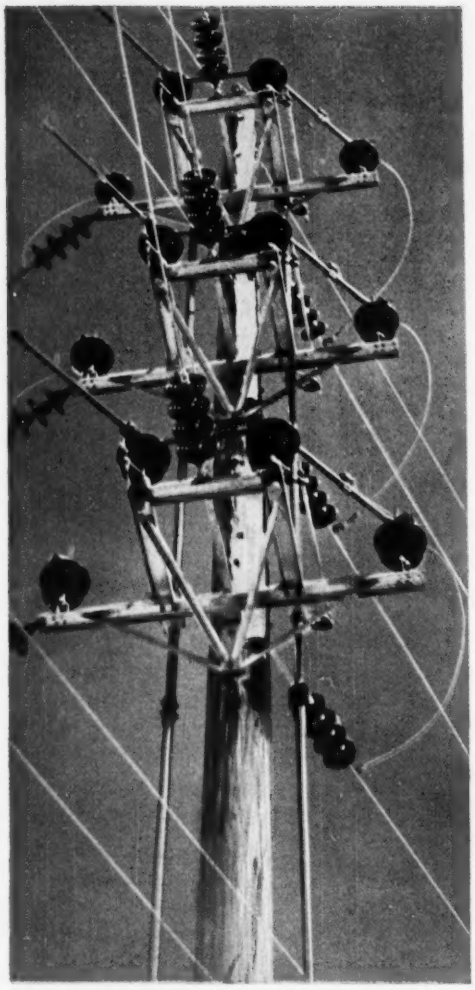
√Added to these advantages, NO Simplex-ANHYDREX Cable HAS EVER FAILED due to water absorption.

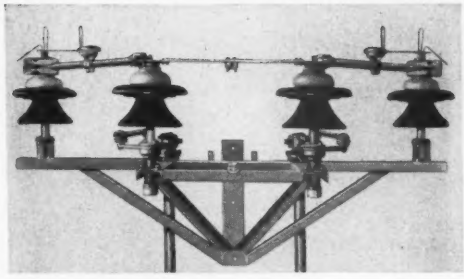
Because "so much depends upon so little," specify Simplex-ANHYDREX XX Cables for the high voltage power distribution system in your switchyards, around industrial plants, etc. You can depend on Simplex-ANHYDREX XX Cables.

Simplex WIRES & CABLES

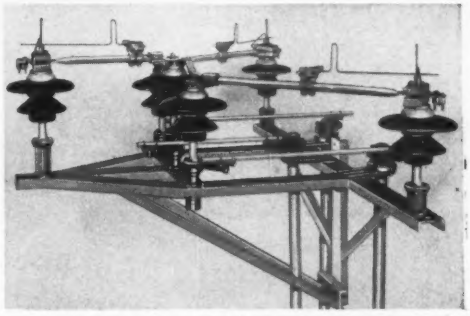
SIMPLEX WIRE & CABLE CO.

79 SIDNEY STREET, CAMBRIDGE 39, MASSACHUSETTS





Shown above is one phase of a Matthews three-phase, two-way Gang Operated Air Break Switch (GOABS). Matthews Goabs are capable of interrupting exceptionally long lines of charging current. In field tests over 65 miles of 66 KV charging current was broken successfully.



With this three-way Matthews GOABS (one phase shown), substation switching, loop inter-connecting or sectionalizing can be accomplished from one switching point. Each set of blades is individually operated.

Matthews GOABS *do* cut installed costs at least 25% because: only one pole per switch is needed . . . minimum right-of-way is required . . . requirements for construction materials are reduced . . . ease of installation saves valuable line-crew time . . . fewer sectionalizing switches are necessary on long transmission lines due to the ability of GOABS to break long lines of charging current. Developed by Matthews less than four years ago, GOABS have been put into service by a great many power companies—in 33 states, Alaska, Hawaii and Puerto Rico. Available in 600 amperes, 15, 23, 34.5, 46, and 69 KV ratings. Write for Bulletin 601-A for more complete information.

This Mark in Trade... MATTHEWS ***Means Highest Grade***

W. N. MATTHEWS COMPANY

DIVISION OF THE A. B. CHANCE COMPANY

3850 DELOR STREET • ST. LOUIS 16, MO.

TOP OF THE LINE

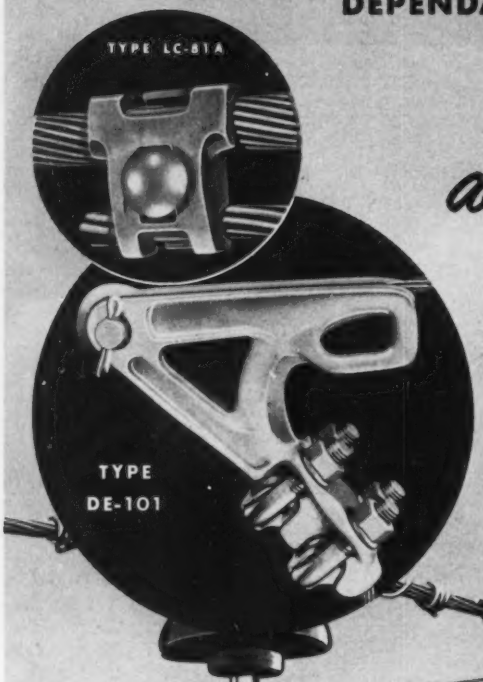
DEPENDABLE, LIGHTWEIGHT, LIFETIME

ANDERSON

Aluminum CONNECTORS

A TROUBLE-FREE COMBINATION . . LC-81A AND DE-101 . . . WITH ALL THE "BUGS" ENGINEERED OUT! DESIGNED FOR EASY HANDLING AND QUICK, POSITIVE INSTALLATION!

ANDERSON connectors, clamps, fittings and accessories are designed and engineered for strength, durability and high efficiency. ABW products are recognized standards in the industry.



ANDERSON makes "top of the line" handling of power connectors, clamps, fittings and accessories *fumble-proof*, too! Usually just one wrench is the only tool a lineman will need.

☆ **ABW DESIGN MEANS QUALITY *plus* STRENGTH in the RIGHT PLACES**

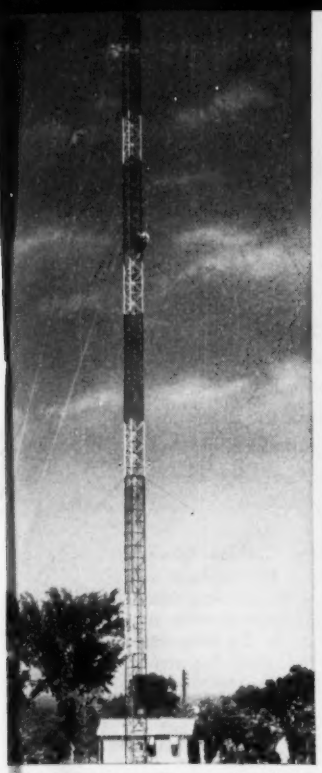
Consult one of our nearest 20 representatives or contact our main office.

Aluminum & Bronze **POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES for SUBSTATION • TRANSMISSION • DISTRIBUTION SYSTEMS** *for over a Quarter Century*

ABW

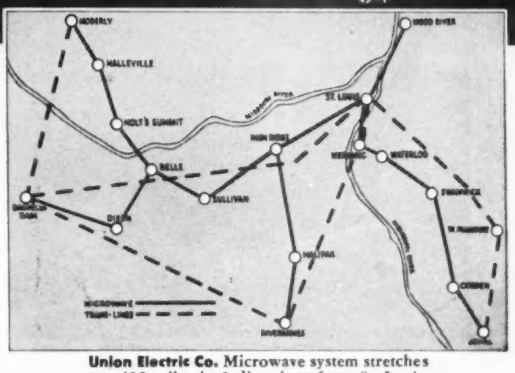
ANDERSON BRASS WORKS, INC.

P. O. DRAWER 2151 • BIRMINGHAM 1, ALABAMA



RCA Microwave radio relay installation at High Ridge, Mo. Towers are rugged, designed to withstand 100-mph winds under severe icing conditions.

Osage Hydroelectric Power Plant installation of Union Electric Company of Missouri, at Bagnell Dam, Mo.—serviced by RCA Microwave.



Union Electric Co. Microwave system stretches out 425 miles in 3 directions from St. Louis.

How UNION ELECTRIC solved today's communication problem

Two years ago Union Electric Company of Missouri ran into the communication problem which sooner or later confronts all growing utilities: their high-line carrier transmission system had become inadequate.

The 150 kc bandwidth, allotted for power line carrier operation, permits the use of only a relatively few channels which are not sufficient to meet all the requirements of a modern communications system. Direct wire lines were ruled out as too costly.

That prompted engineers to adopt Microwave, supplemented with mobile radio at major relay points. RCA Microwave provides channels for remote control of load dispatching, telemetering, teletype and voice communication. It results in close co-ordination of vehicles, field crews, executive and service personnel at outlying offices and stations. And, 70% of the RCA Microwave system is available for future expansion.

RCA Microwave can be interconnected with existing phone lines and switchboards. It uses familiar channeling circuits and readily available tubes. It provides as many channels as needed with minimum use of frequency space.

Now Union Electric has dependable, year-round communications over the full length of its operations. RCA "dish" antennas atop 100- to 300-foot towers, spaced 11 to 46 miles apart, send concentrated beams of radio energy from station to station. The radio beams follow a line-of-sight path—approximately parallel to the transmission lines.

You, too, can plan now for tomorrow's problems—prepare for your expanding communications needs before they develop. The booklet listed below provides quickly digested facts for future thinking, *with no obligation on your part.* Mail the coupon. *Remember,* only RCA can provide the nation-wide service facilities of the RCA Service Company.

RADIO CORPORATION of AMERICA
COMMUNICATIONS EQUIPMENT CAMDEN, N. J.

Dept. 45XD, Building 15-1

Please send me your reprint describing Union Electric Microwave system, *"Microwave Relieves Overloaded Circuits."*

Name_____ Title_____

Company_____ Address_____

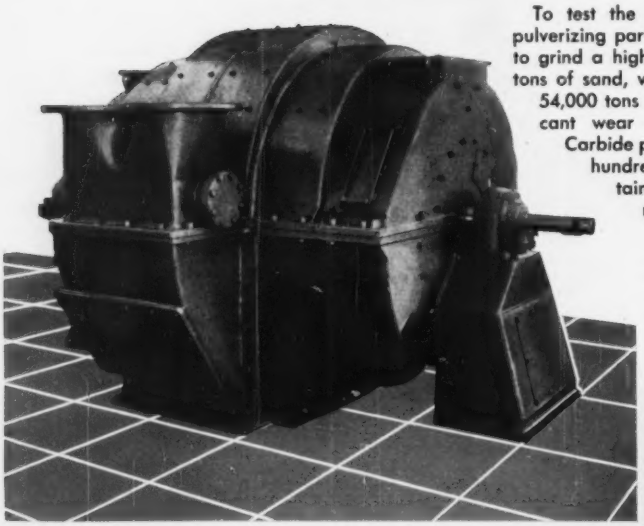
City_____ Zone_____ State_____

☐ Have an RCA representative get in touch with me.

One Reason for Long Operating Performance and Low Maintenance of

RILEY "50" Pulverizers...

Tungsten Carbide facing on pulverizing parts of Riley "50" Pulverizers has demonstrated phenomenal resistance to abrasion in coal grinding service . . . And no wonder! Tungsten Carbide is the hardest of manufactured materials . . . approaching the hardness of the diamond! It is so tough and wear resistant that it is used in bits for stone drilling and mining. Naturally, then, Tungsten Carbide is the best material for use in coal pulverization.

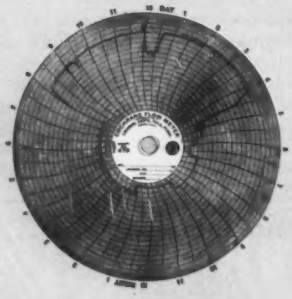


The Riley "50" Duplex Pulverizer

To test the performance of Tungsten Carbide faced pulverizing parts, Riley Engineers set up a Riley Pulverizer to grind a highly abrasive silica sand. After grinding 180 tons of sand, which is the equivalent in abrasive wear to 54,000 tons of coal of an average quality, the insignificant wear which occurred indicated that Tungsten Carbide parts in Riley "50" Pulverizers could pulverize hundreds of thousands of tons of coal with sustained high fineness before requiring replacement. Maintenance records of Riley "50" Pulverizer installations have proved the effectiveness of tungsten carbide in providing long continuous periods of operation with low maintenance costs per ton and sustained fineness.

Here are other ways by which you'll profit from Riley "50" Pulverizers

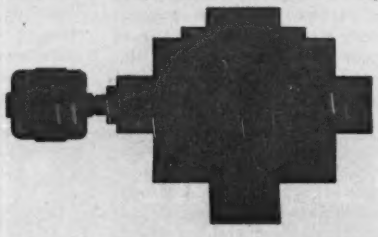
Save Fuel!



Sustained high degree of fineness and complete combustion with Riley burners maintain low carbon losses. Also many Engineers find it hard to believe the wide load ranges and stable ignition possible with Riley Pulverizers. Many Riley installations operate with load ranges of 10 to 1 with perfectly stable operation.

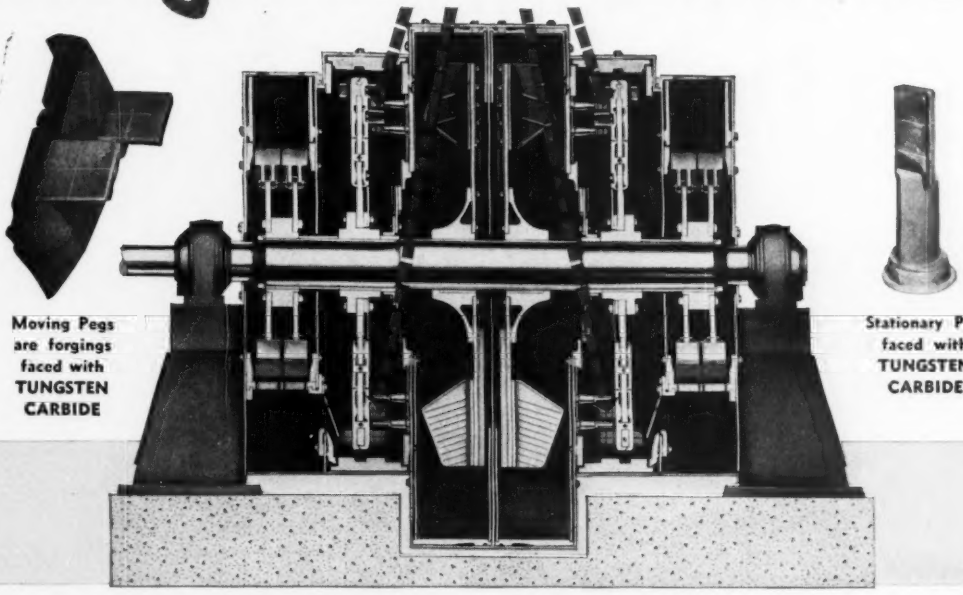
Save Space!

A typical 40,000 lbs/hr. Riley "50" model weighs only 46,000 lbs. and requires a mere 27" deep reinforced concrete foundation. Complete with motor it occupies a space only 18' 6" long x 10' 8" wide x 7' 0" high.



Be sure to ask your Riley Representative to point out the

tungsten carbide!



Moving Pegs are forgings faced with **TUNGSTEN CARBIDE**

Stationary Peg faced with **TUNGSTEN CARBIDE**

TRADE MARK Rx REGISTERED

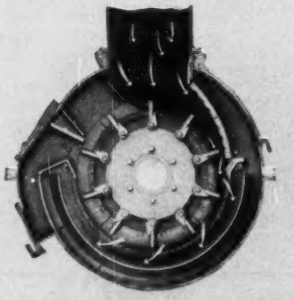
RILEY
STOKER CORPORATION

WORCESTER, MASS:
Boston, New York, Philadelphia, Buffalo, Washington, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Tulsa, Houston, Denver, Salt Lake City, Los Angeles, Portland, Seattle

COMPLETE STEAM GENERATING UNITS

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • ECONOMIZERS
WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

Save On Capital Investment!



There is no need to install an oversized mill to take care of coals of high moisture. New Crusher Dryer section is designed with ample capacity for coals of highest moisture content. Surface moisture of coal is evaporated in this section before entering main pulverizer. There is no capacity reduction with increase in moisture. In addition, foreign materials and tramp iron are rejected, thereby, reducing maintenance and preventing damage to pulverizing parts.

Quiet Operation!

Heavy duty railway type bearings and absence of metal to metal contact insures quiet, vibrationless operation. Even when coal feed is shut off the "50" Pulverizer operates quietly, without wear of parts.

many operating advantages of the new Riley "50" Pulverizer.

Here's the Current Transformer You've Been Asking For!

New MOLDED CURRENT TRANSFORMERS

for 600-Volt Indoor or Outdoor Service

Maintenance Eliminated! This new "thru-type" current transformer is molded in thermo-setting resin. There is nothing to deteriorate . . . plastic never requires painting. Only secondary terminal studs and base mounting studs project through the plastic — a perfect seal is established at these points, thanks to the high adhering properties of the plastic. The projections are threaded and non-corrodible. You get excellent resistance to weathering.

Installation Simplified! The transformer is small and compact. Installation time is reduced because there are no bolted connections — a feature of "thru-type" design. Future changes caused by load growth are simplified too. An elliptically shaped window (1⅜ by 2¾ inches) has plenty of room for two 500 MCM conductors with 600-volt insulation.

Secondary terminals are on top of the transformer to permit closer mounting . . . you can connect secondary leads from either side. The secondary terminals are protected by a weather-resistant sealable cover. You can substitute a condulet box if desired.

A-4181

4 Ratings — Current ratings available in type TWM with line conductor passing once through the primary window are: 200 to 5, 400 to 5, 600 to 5, and 800 to 5. Intermediate ratings may be obtained by looping the primary conductor through the window two or more times.

Type TWM transformers have conventional accuracy for light burden metering. The 200-amp rating has ASA accuracy classification of 0.3 with burden B-0.1 and 0.6 with burden B-0.2. The 400, 600, and 800-amp ratings have 0.3 accuracy at burdens of B-0.1 and B-0.2.

For complete information, call your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

From Switchboard Wires to Power Cables... *specify* U. S. RUBBER

A typical example of "U. S." leadership is Laytex-Neoprene Supervisory Control Cables. In its 19 years of manufacture, not once has a failure of this cable ever been reported. The insulation resistance of these cables actually improves in wet locations.

The small diameter of the Laytex® insulation makes unnecessary the enlargement of cable ducts where signal service is expanding. The Neoprene jacket provides high resistance to abrasion and other abuse, and is highly resistant to oil, flame, and sunlight. The cables are light in weight, easy to install. United States Rubber Company, Electrical Wire and Cable Department, Rockefeller Center, New York 20, N. Y.

PRODUCT OF

U.S.RUBBER

SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

here's a

GOOD SIGN

that

Cope

CABLE INSTALLATION EQUIPMENT IS ON THE JOB

For 65 years Cope equipment has been used most everywhere that cable is being installed. The rugged construction of the many items comprising the Cope line, plus the ease of handling and using them, has created a wide preference for them.

Recently added to the line is the Type-B Warning Sign shown here. It features exceptional wind resistance which results from the panel being balanced to hang vertically and allowed to swing. This sign really *stays in position* for constant worker safety.

The yellow panel, 18 inches square with five inch high black letters, has high visibility. A flag holder is provided and the entire unit folds flat for transportation. Ask for our new Catalog 65 showing the complete Cope line.

T. J. Cope INC.

711 South 50th St., Philadelphia 43, Pa.

Now you can fish underground conduits in a matter of minutes

with the Cope

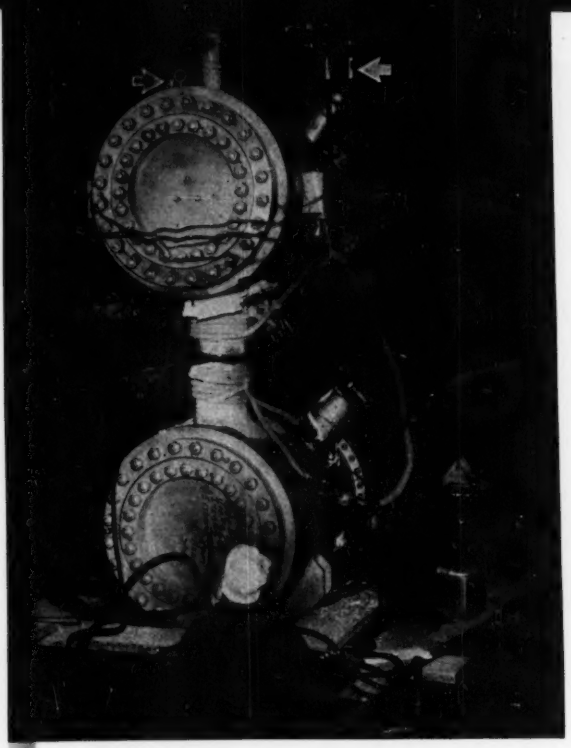
PNEUMATIC FISHLINE

Here is a real time and money saver. For years, used for underground conduit fishing with outstanding success, it now features numerous design improvements. It is in fact a compact, portable air-gun that shoots a Neoprene projectile through a conduit to a "target" manhole and when reversed it draws back a lead wire or cleaning tools as necessary.

Just one man can position the Cope STRINGING SHEAVE

This two part unit with a complete weight of only 29 pounds greatly simplifies handling and positioning. The special vise type chain is much easier to wrap around pole while its stronger grip prevents slipping from set position. Lifting of cable to place in messenger hanger is unnecessary. Self-aligning mounting prevents creeping up the saddle with possible damage to cable lashings. Use it for cable up to 4 inch diameter.

OTHER COPE CABLE INSTALLATION EQUIPMENT preferred for 65 years



Another specific reason why it's Kellogg . . .

when reheat is the order!

OCCASIONALLY there arises a unique situation which specifically demonstrates why Kellogg has been selected so frequently to fabricate and erect the power piping for high temperature reheat units during the current power expansion period.

This one occurred during the installation of the piping for the Albany station of the Niagara Mohawk Power Corporation. In connection with improving the economics of the overall system, which includes the reheat cycle, Niagara Mohawk engineers developed a considerably simplified piping arrangement between the high pressure extraction heaters . . . one which eliminated customary expansion loops.

However, although this design had economic advantages, it posed a problem: Because of the absence of expansion loops, how severely would thermal expansion during the high heat of welding and heat treatment strain the flanges and bolts on the heaters? Excessive stresses on these joints might well cause leaks in service.

Since it is virtually impossible to calculate these forces with any accuracy, Kellogg called upon its stress analysis group to devise a procedure for controlling them. This was accomplished by the use of electrical strain gages mounted on supporting rods and on the heater shell as shown in the photograph. (See arrows)

As a result of readings taken throughout the cycle, standards were established for the field assembly of this design which assure protection of the flanged joints of these heaters.

Special groups which specialize in stress analysis with its required knowledge of mechanics of materials—of plastic and elastic theory . . . continuous research and development towards further improvements in materials and in fabricating and erecting techniques . . . continuous accumulation of a tremendous store of experience in fabricating and installing piping for more than six million KW's of output—these are among the reasons why "Reheat Power Piping by Kellogg" is so often the specification . . . 40 times within the recent expansion period.

These leading companies are among the many major producers of power who use M. W. KELLOGG POWER PIPING . . .

- Societa Meridionale Di Elettricita (Italy)
- Sociedad De Electricidad De Rosario (Argentina)
- Union D'Electricite (France)
- United Illuminating Co.
- Westinghouse Electric Corp.
- West Penn Power Co.
- Wisconsin Public Service Corp.

OTHER FABRICATED PRODUCTS including: Pressure Vessels . . . Vacuum Vessels . . . Fractionating Columns . . . Drums and Shells . . . Heat Exchanger . . . Process Piping . . . Bends and Headers . . . Forged and Welded Fittings . . . Concrete and Radial Brick Chimneys

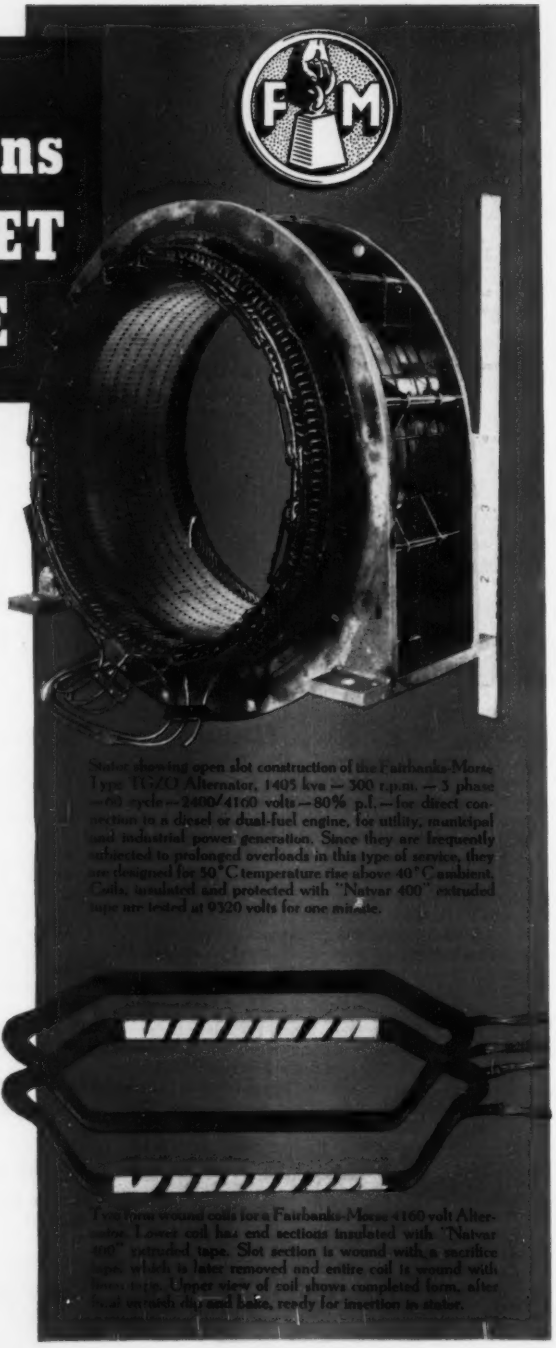
For further information, details or methods, etc. contact

FABRICATED PRODUCTS DIVISION
THE M. W. KELLOGG COMPANY
225 Broadway, N. Y. 7, N. Y.
or offices in Jersey City, Buffalo, Los Angeles
Tulsa, Houston, Toronto, London and Paris

KELLOGG — A DIVISION OF PULLMAN INCORPORATED

KELLOGG
HIGH TEMPERATURE
HIGH PRESSURE
POWER PIPING
KELLOGG
HIGH TEMPERATURE
HIGH PRESSURE
POWER PIPING
KELLOGG
HIGH TEMPERATURE
HIGH PRESSURE
POWER PIPING
KELLOGG
HIGH TEMPERATURE
HIGH PRESSURE
POWER PIPING

NATVAR 400 means this Stator is SET FOR *LONG* LIFE



Stator showing open slot construction of the Fairbanks-Morse Type TC-70 Alternator, 1405 kva — 300 r.p.m. — 3 phase — 60 cycle — 2400/4160 volts — 80% p.f. — for direct connection to a diesel or dual-fuel engine, for utility, municipal and industrial power generation. Since they are frequently subjected to prolonged overloads in this type of service, they are designed for 50°C temperature rise above 40°C ambient. Coils, insulated and protected with "Natvar 400" extruded tape are tested at 9320 volts for one minute.

Two form wound coils for a Fairbanks-Morse 4160 volt Alternator. Lower coil has end sections insulated with "Natvar 400" extruded tape. Slot section is wound with a sacrifice tape which is later removed and entire coil is wound with insulating tape. Upper view of coil shows completed form, after final varnish dip and bake, ready for insertion in stator.

Fairbanks-Morse has been building high dependability power generating equipment for 50 years. They have safeguarded the "name worth remembering" by sound engineering and workmanship, and careful selection of materials.

To insulate and protect stator coils of alternators, Fairbanks-Morse uses "Natvar 400" extruded tape because of its consistently good electrical and physical properties, and resistance to high temperatures.

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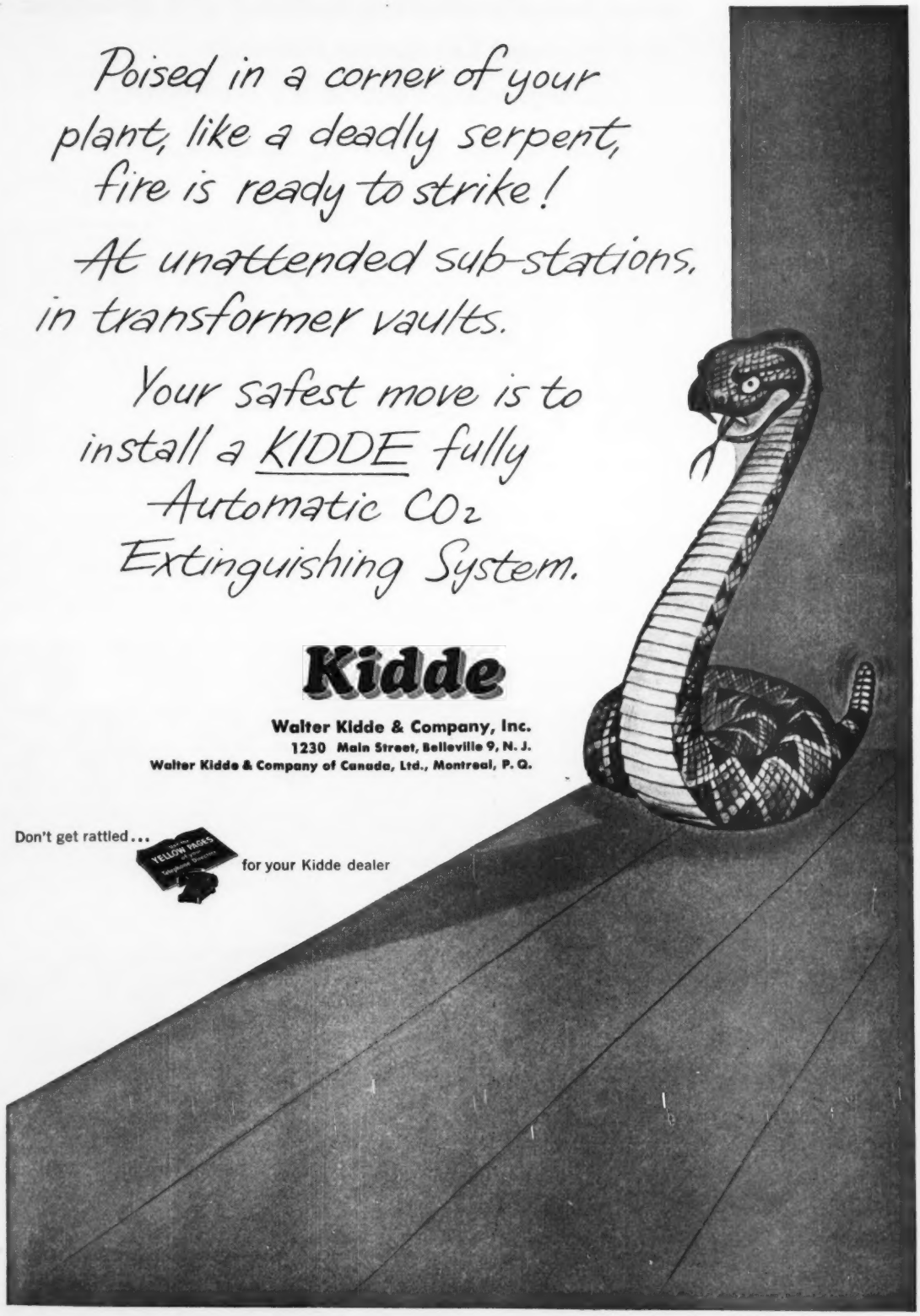

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How Burndy Limiters Isolate Faulted Cables and Prevent Extensive Damage in Underground Secondary Networks

by **IRVING MATTHYSSE** *Chief Design Engineer, Burndy Engineering Company*

Prompt, selective clearing of severe electrical faults in underground secondary cables is of utmost importance in preventing extended loss of service to customers, the possibility of explosion and fire as well as expensive replacement and repair. Reliance on system capacity alone to burn faults clear is dangerous as it obviously gives faults greater leeway to "hang on", to spread, to cause "roasting" of cable insulation and destroy hundreds or even thousands of feet of cable before cutting crews can arrive on the scene.

It is for this reason that an ever increasing proportion of utilities are using Burndy Limiters in their secondary systems. These limiters are expressly designed to clear short circuit currents quickly, although the time-current characteristics of the device are such that normal electrical overloads—which will not harm the insulation of the cable—can be carried for long periods of time.

The Burndy Limiter basically is a combination fuse and cable connector, rated in terms of voltage and cable size, according to the cable which it is designed to protect. (Time-current characteristic curves are shown on opposite page).

Let us see how the Limiter functions under typical fault conditions:

Referring to Fig. 1, we see a typical AC secondary network system with one of the 3 phases shown. For clarity, this has been somewhat simplified. It is apparent that a network is essentially a grid (in practice often conforming to the pattern of the city's streets) inter-connected at all junctions. Power is fed into certain junctions of the secondary mains (usually 220 volts) by means of transformers which convert the voltages from incoming primaries or high voltage feeders (usually 4,160 volts or higher). Limiters are shown at junction B.

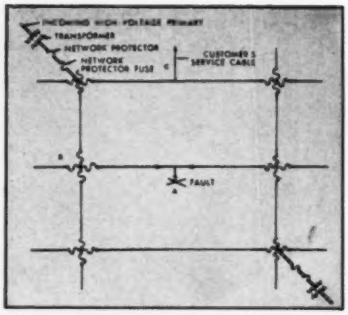

Fig. 1—Typical AC Secondary Network

Assume that the fault occurs at point A, Fig. 1. Current is supplied to the fault via junction B through the Limiter in the faulted cable. The fault current at junction B is divided among the other 3 Limiters, and it follows that the Limiter in

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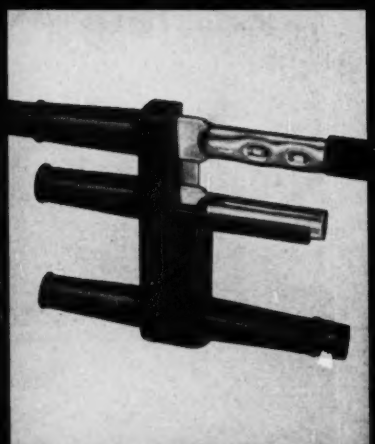
Burndy Moles have multiple outlets, from 2 to 18 per unit, permitting reserves for future use. Each outlet will take a range of cable sizes. Easy interconnection of Moles permits great flexibility of expansion.

Burndy Hycrabs are multiple connectors providing permanent compression joints. Four to twelve outlets per unit. Completely insulated, Hycrabs are compact and lightweight. Cables quickly, easily installed with Burndy Hypresses.

For coordinated cable protection, a variety of Burndy Limiters is available to isolate and localize cable faults. Limiters may be used with Moles, Hycrabs, or on ring bus

Call your Burndy representative for details or write for Underground Catalog Z47.

Installed Burndy Mole showing socket and nut method of connection. Plugs, like the one shown, protect unused outlets until needed for expansion.



Cutaway picture of Burndy Hycrab. Note heavy molded rubber insulation and simple indent method of installation.

the faulted cable will blow. A similar action occurs in the other end of the faulted cable. Acting in this way, Limiters isolate the faulted cable from the network without disturbing the rest of the network. The source of the trouble can be quickly located, easily repaired. Explosions due to overheated insulation, and spread of damage, are prevented.

Coordination of Limiter and Cable Insulation Damage Curve

Since the basic function of the Limiter is to protect the cable which is faulted, *the Limiter must blow before the insulation reaches the roasting point.* Hence, a properly designed Limiter must coordinate with the insulation damage characteristic of the cable.

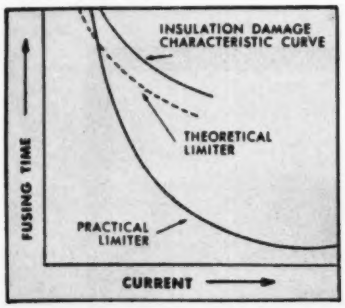


Fig. 2—Typical Insulation Damage Curve

Fig. 2 is a typical insulation damage curve of time plotted against current (seconds vs. amperes) showing the insulation damage characteristic curve for a specific size of cable. In addition, the ideal Limiter curve and the practical Limiter curve are shown. The ultimate Limiter is simple, rugged enough to withstand normal operating conditions during the life of the cable, and practical to manufacture.

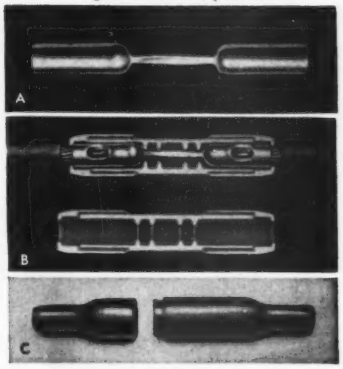
Since Limiters are also electrical connectors, they take many forms. In all cases, these Limiters are secured to the cables by means of a mechanical or a compression type connection. No solder is used, because, at the operating temperatures required of Limiters, solder would melt and therefore prevent proper Limiter operation.

Limiters must coordinate with the cable, coordinate with each other, coordinate with Network Protector Fuses. Through engineered design and accurate fabrication, Burndy maintains the integrity and quality of this product, and makes Limiters one of the most valuable assets in the operation of modern AC secondary networks.

All component parts of a Limiter Assembly are shown in Fig. 3.

Fig. 3A shows the Limiter itself. This connector has been fabricated from a single length of copper tubing and is hot-tin dipped. It is composed of two sockets

Fig. 3—Limiter Components



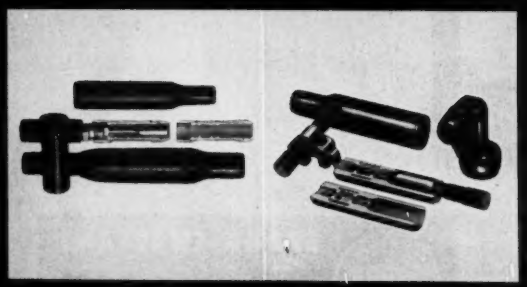
joined by a fusible section which has been flattened and is accurately formed to provide proper fusing characteristics. Fig. 3B shows the cables installed at each end by indenting with a Burndy Hypress. The heat resistant shell incorporates barriers which quench the arc rapidly. Fig. 3C shows the insulating sleeve which is used over the entire assembly and sealed by taping.

In particular, note the shape of the fusible section. The reduced section at either end enables the Limiter to have a characteristic curve more nearly approaching the theoretical curve by reducing the heat drain to more massive ends of the Limiter.

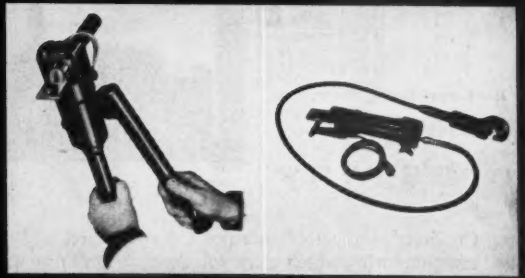
53-21

GROUND

BURNDY MOLE LINE EQUIPMENT



Burndy Limiters. Two variations are shown. At left, Molimiter installed on Mole. At right, exploded view of Limiter Tap before compression—a ring bus connector which also provides overload protection.



Manual Hypress, weighing 9 lbs., delivers 9 ton crimping force. Neoprene covered. Rotating head 90°. Foot operated. Hypress handles cable through 2,000 Mcm with pressures to 80,000 lbs. Swivel jointed, flexible, high pressure hose permits use at any angle. Ground lead protects operator.

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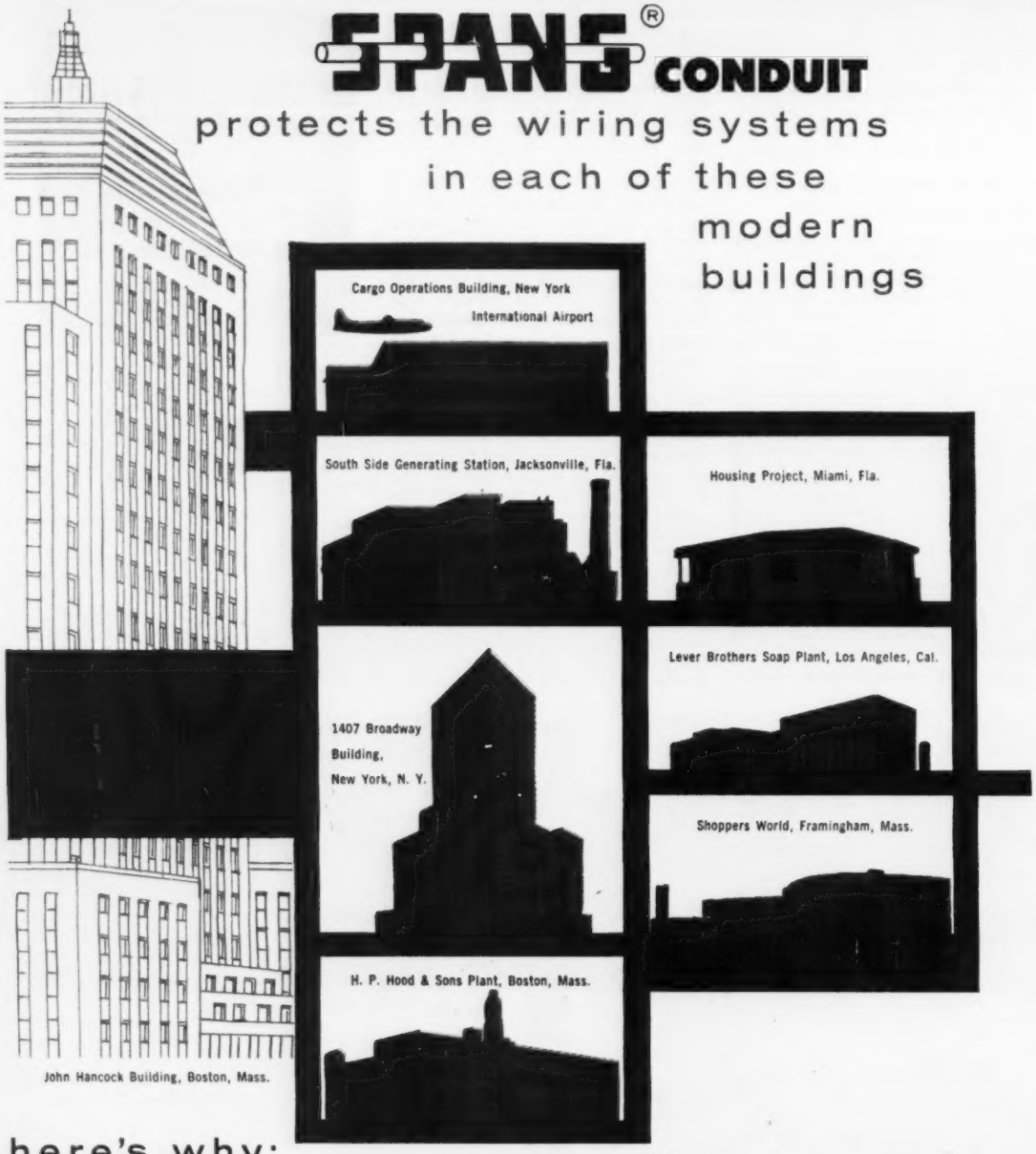
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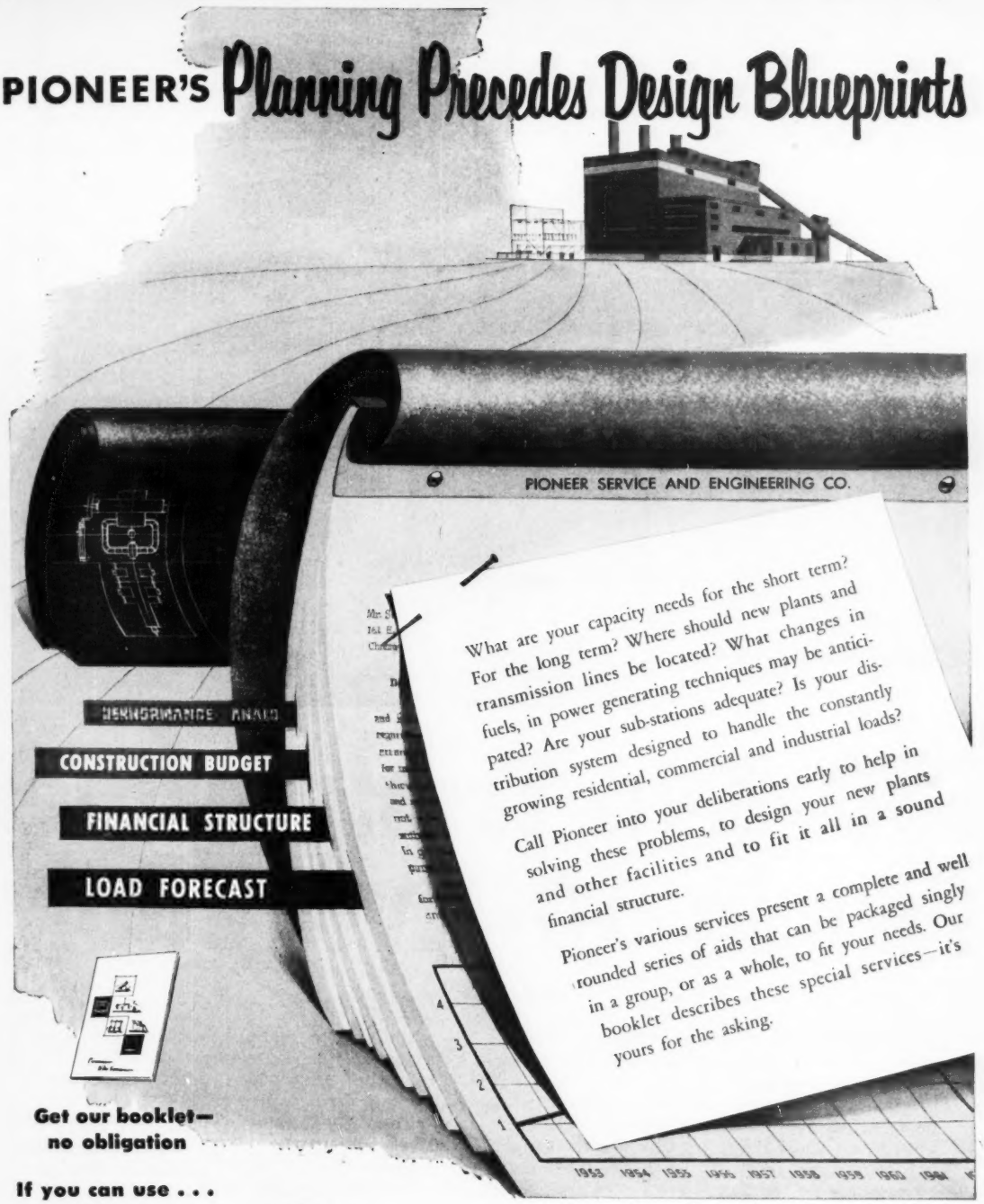
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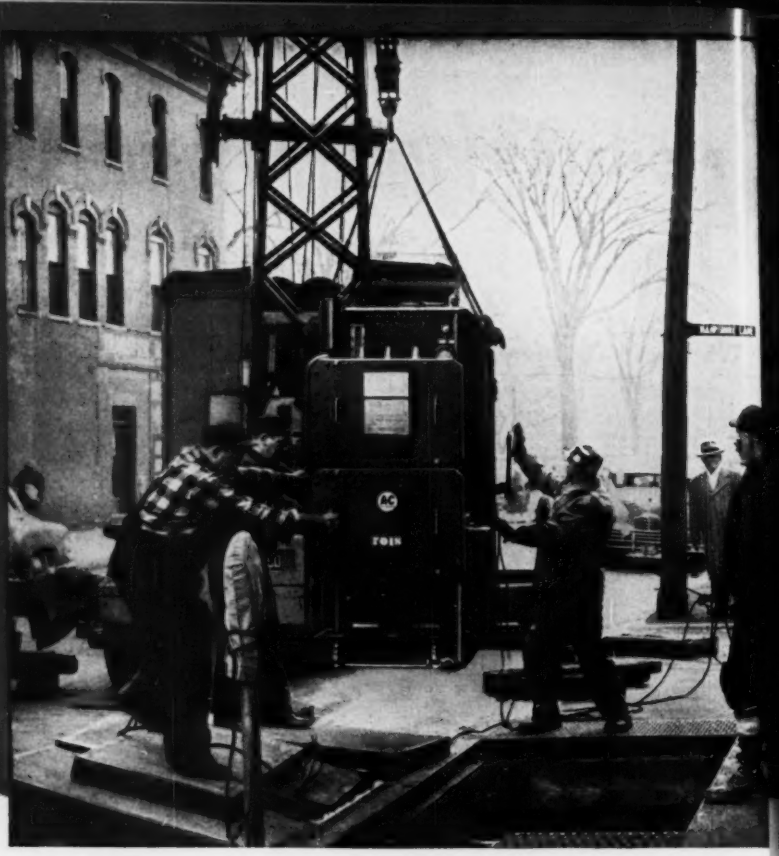


500-Kva Transformer Fits in 50-Kva Vault

When Public Service Company of New Hampshire increased many kva sizes in their network system due to load growth, it was evident that the original planning was wisely made for future expansion. The above photograph tells why. It shows a 500-kva Allis-Chalmers transformer being placed in a vault which originally housed a 50-kva transformer. Except for addition of a new vault cover, no vault changes were needed because of the new 500-kva Allis-Chalmers network transformer's compact design. Thus, installation costs were held to a minimum.

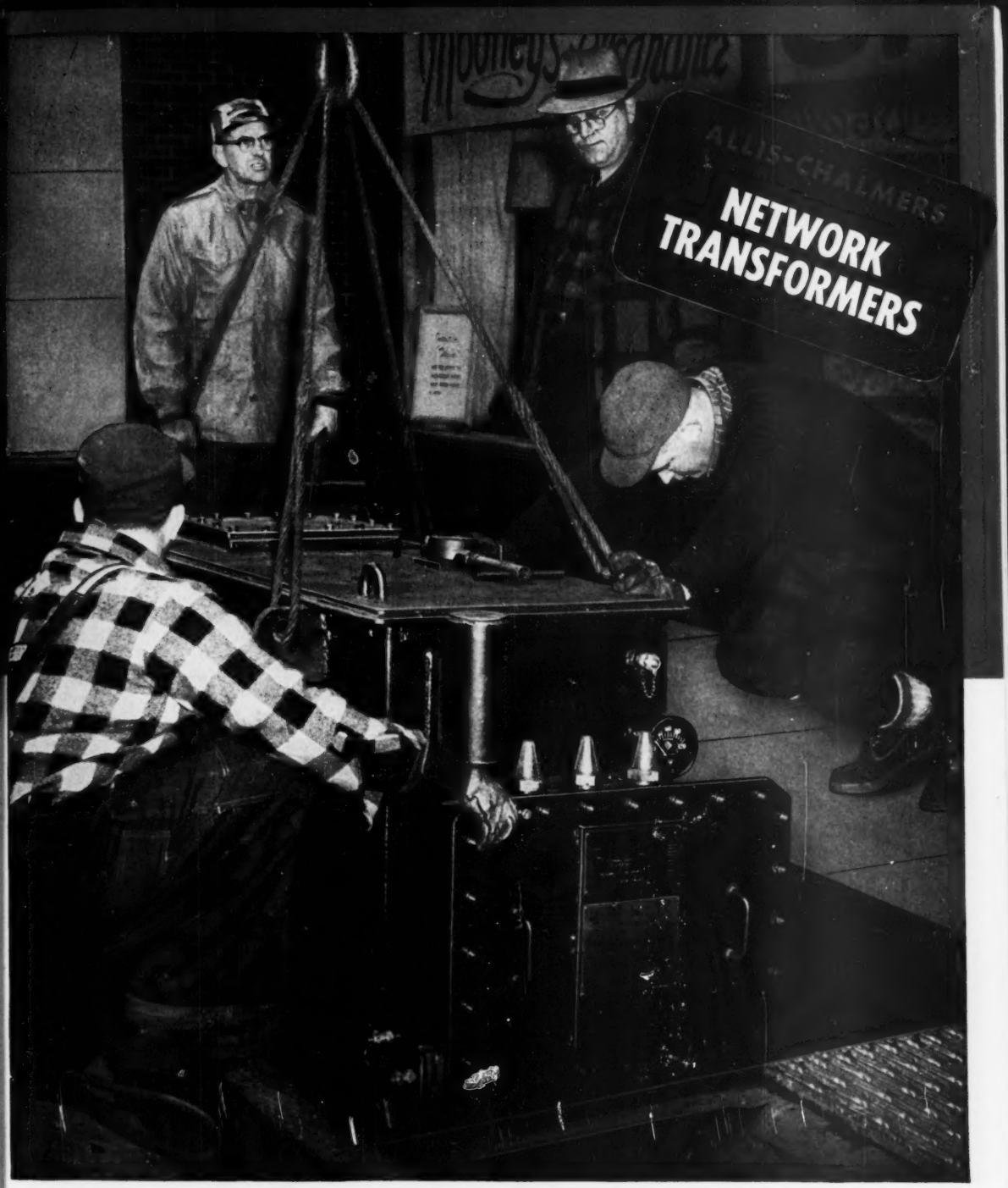
Dependability Important

Installing a transformer in close quarters like this, places greater than usual importance on dependability. The rugged construction of Allis-Chalmers transformers, backed by most careful attention to manufacturing details, enabled them to measure up to the job. For example—a special bituminous compound gives added protection to surfaces and tubes in the base area. And spiral wound metallic gaskets give the best possible sealing for bushings. Welded covers, too, help eliminate future gasket maintenance.

Equally important is the location of transformer accessories, especially when working with limited dimensions. All of the accessories are located for convenient observation or operation.

More Details Available

There are many more reasons why it will pay to investigate the advantages of Allis-Chalmers network transformers. Get more details from your nearby Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4075



Here an Allis-Chalmers transformer is being installed at the corner of West Central Street and Hampshire Lane in Manchester, N. H. Neighborhood is an average growth area, but one where network reliability is extremely important. It includes stores, apartments, a school, and several restaurants. This 500-kva Allis-Chalmers transformer replaced a 50-kva transformer. The vault did not have to be enlarged.

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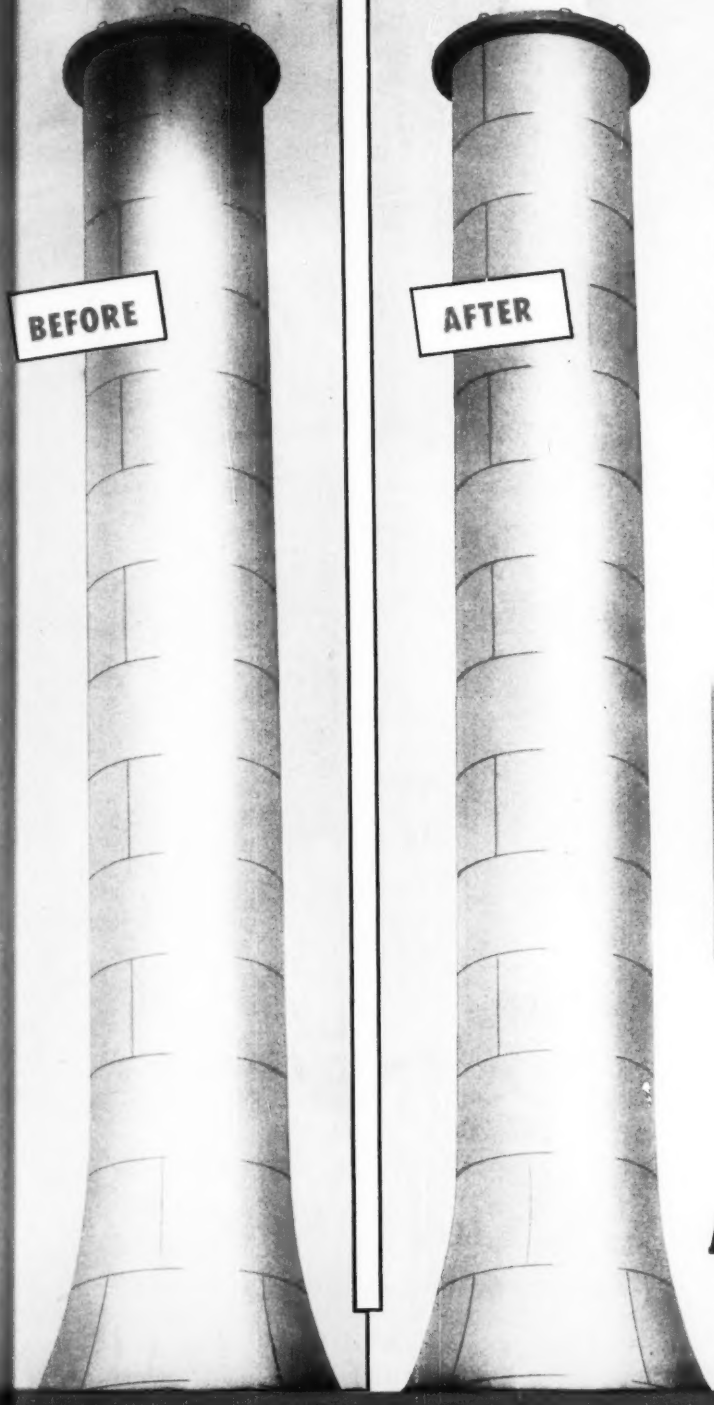

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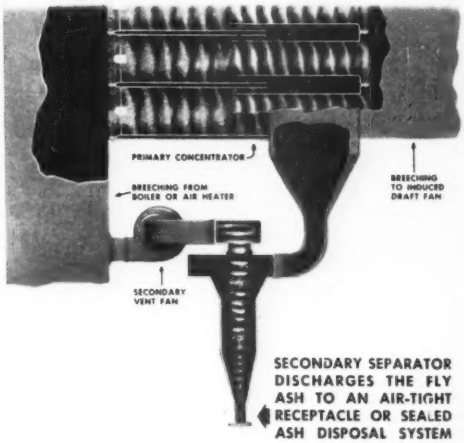

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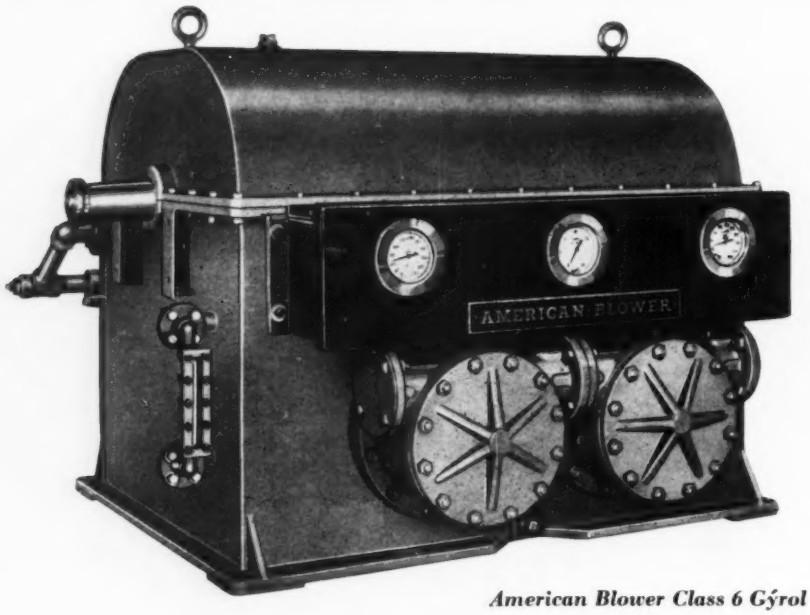

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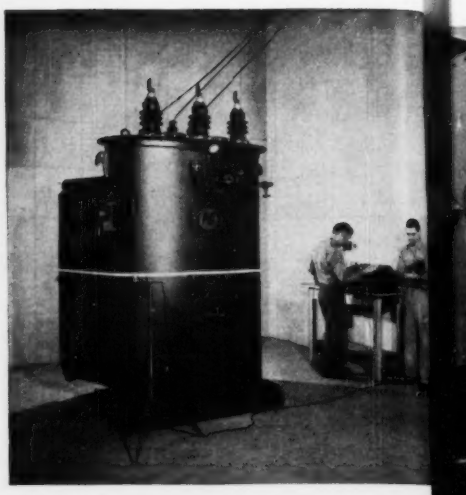
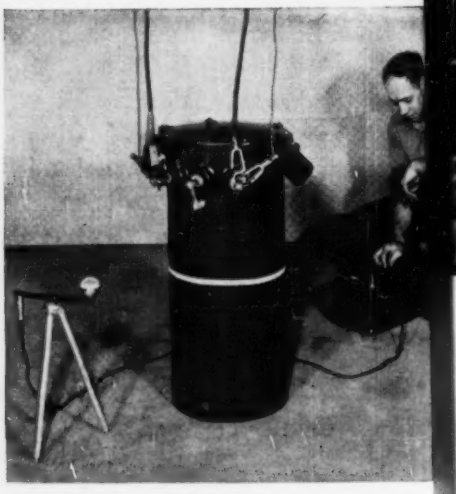
Huge doors lock out external noise after transformer is in position for testing. Allis-Chalmers sound laboratory has been in use since 1949.



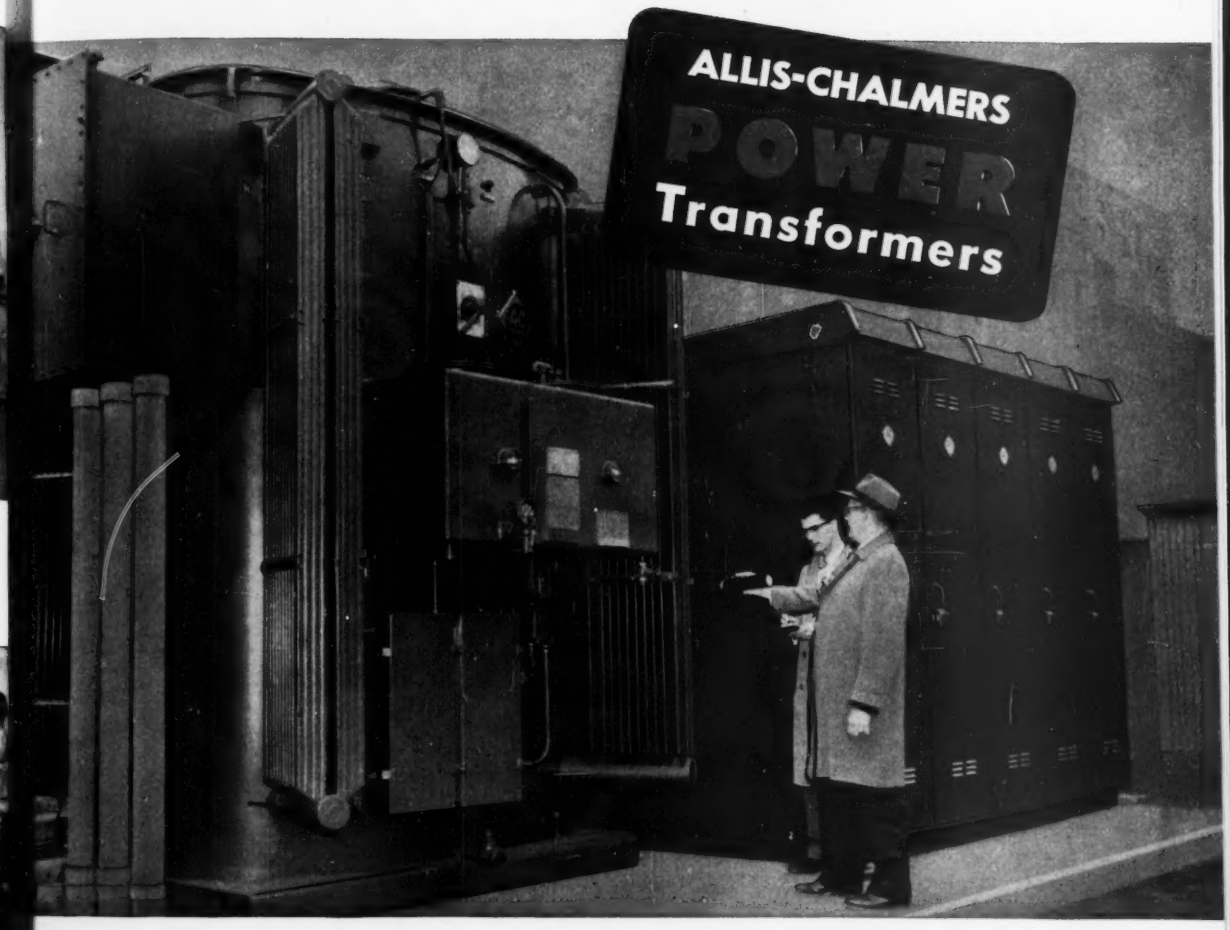
Analyzing noise for harmonic content on a 1000 kva transformer. Ambient noise level of laboratory is 28 d.b., a reduction of approximately 42 d.b. from level of outside noises.



A distribution transformer gets audio sound level tests. Physical noise level testing instruments and harmonic index are new tools in the measurement of sound energy.

ALLIS-

a Good Neighbor



Good neighbors are quiet neighbors. To help utilities become welcome neighbors in residential and commercial areas, Allis-Chalmers has been applying to its transformers and substations the lessons learned in its large sound laboratory, which was placed in operation in 1949.

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Intensive research, now in its fifth year, has resulted in uniformly quiet transformers throughout the range of sizes constructed. Proof comes in the field when tests show reduced sound levels on transformers like the one pictured above.

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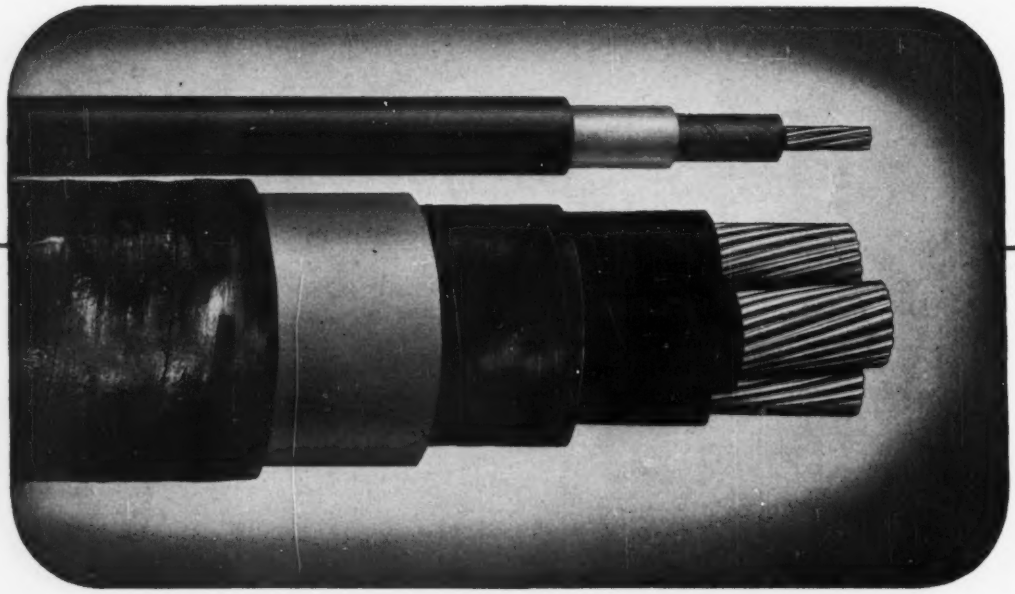
for utilities, chemical plants and the petroleum industry



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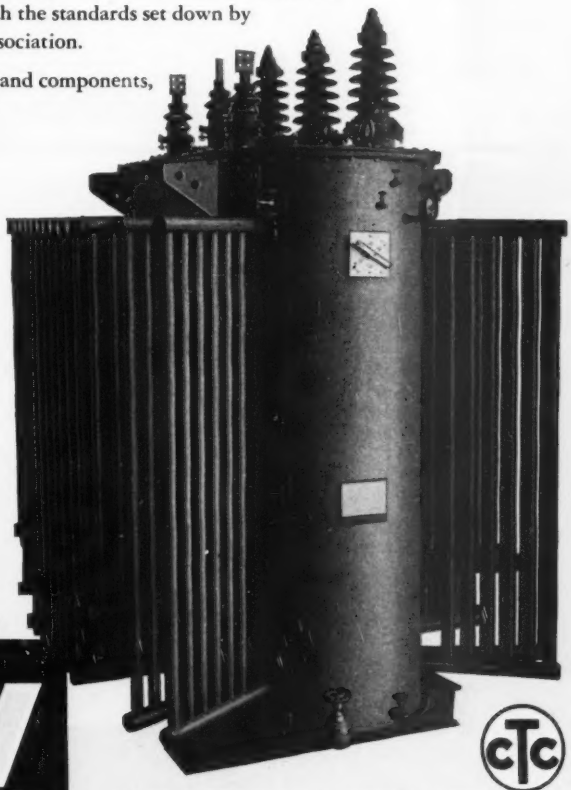
Shown at right is a 3000 KVA, 3 Phase OISC, 46 KV Primary.



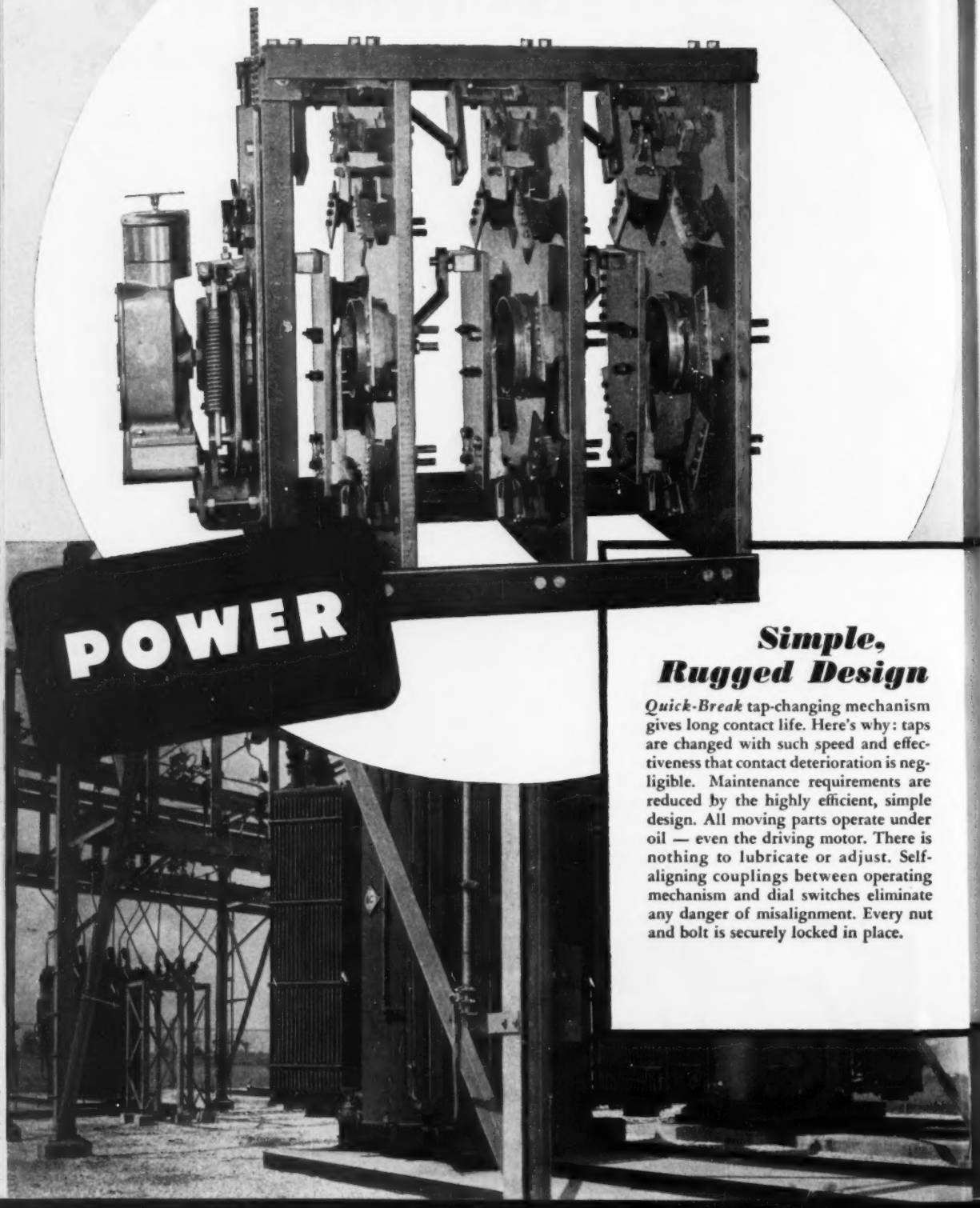
"Designed to Eliminate Radio Interference"

Central
TRANSFORMER CORP.

CTC

PINE BLUFF, ARKANSAS
SALES OFFICES IN PRINCIPAL CITIES

20 Years'



Simple, Rugged Design

Quick-Break tap-changing mechanism gives long contact life. Here's why: taps are changed with such speed and effectiveness that contact deterioration is negligible. Maintenance requirements are reduced by the highly efficient, simple design. All moving parts operate under oil — even the driving motor. There is nothing to lubricate or adjust. Self-aligning couplings between operating mechanism and dial switches eliminate any danger of misalignment. Every nut and bolt is securely locked in place.

Field Proof-

Here's the Tap-Changing-Under-Load Mechanism That Has Given 20 Years of Unequalled Performance

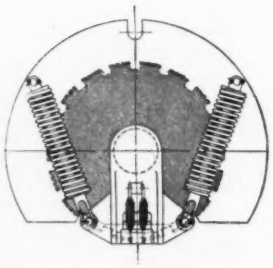
Field-proved — and unsurpassed in twenty years — that's the story behind Allis-Chalmers famous *Quick-Break* tap-changing mechanism. No other tap changer on the market gives you its combination of ruggedness, accuracy, and simplicity — features that add up to practically trouble-free operation.

Laboratory-proved — tests show that the *Quick-Break* mechanism will withstand 5 million operations — equivalent to over one hundred years of normal service. The *Quick-Break* mechanism was designed to operate under the most difficult conditions. After twenty years of field operation, it is still the simplest, most efficient means of changing taps under load.

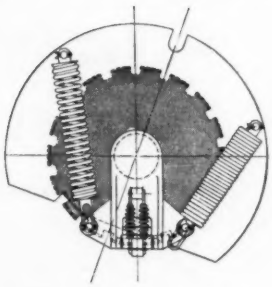
Get More Facts. If you don't have all the facts already, it will pay you to get more details by contacting your nearby Allis-Chalmers office or writing Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4193

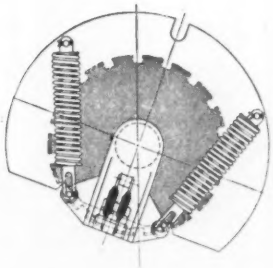
How It Works



1 Dial switch operates on the balanced spring principle. Components include outer moving segment, inner stationary index plate, and powerful springs for fast drive snubbing action.



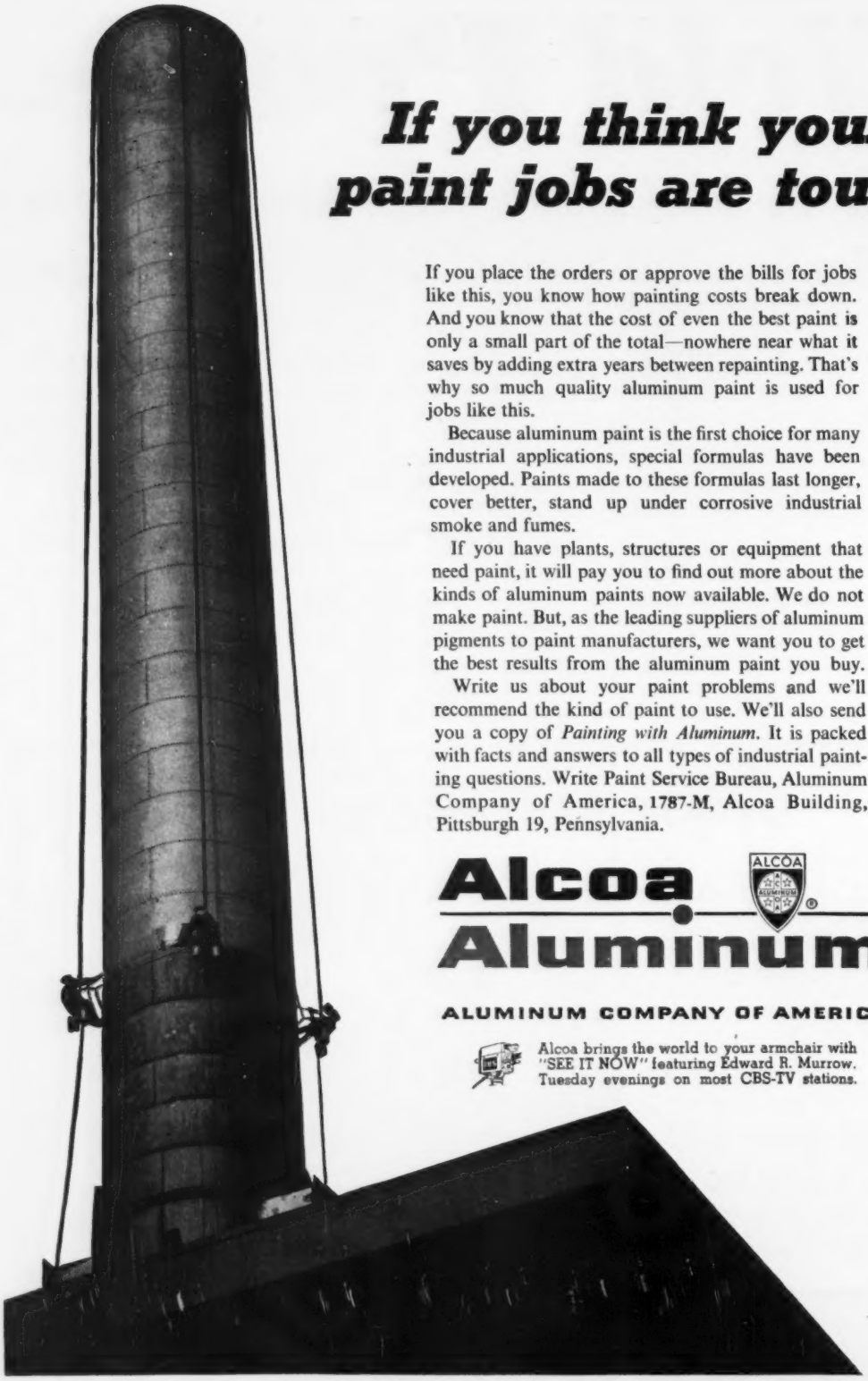
2 Start: driving motor rotates outer segment but latch on crank arm holds tap switch in position. Heavy-duty springs store energy to produce quick start and stop of switch.



3 Finish: cam on segment lifts latch. Released spring tension rotates switch swiftly to next operating position. Latch locks switch and places mechanism in position for next change.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS



If you think your paint jobs are tough

If you place the orders or approve the bills for jobs like this, you know how painting costs break down. And you know that the cost of even the best paint is only a small part of the total—nowhere near what it saves by adding extra years between repainting. That's why so much quality aluminum paint is used for jobs like this.

Because aluminum paint is the first choice for many industrial applications, special formulas have been developed. Paints made to these formulas last longer, cover better, stand up under corrosive industrial smoke and fumes.

If you have plants, structures or equipment that need paint, it will pay you to find out more about the kinds of aluminum paints now available. We do not make paint. But, as the leading suppliers of aluminum pigments to paint manufacturers, we want you to get the best results from the aluminum paint you buy.

Write us about your paint problems and we'll recommend the kind of paint to use. We'll also send you a copy of *Painting with Aluminum*. It is packed with facts and answers to all types of industrial painting questions. Write Paint Service Bureau, Aluminum Company of America, 1787-M, Alcoa Building, Pittsburgh 19, Pennsylvania.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA

Alcoa brings the world to your armchair with "SEE IT NOW" featuring Edward R. Murrow. Tuesday evenings on most CBS-TV stations.

NEW

No. 53-XPJ Nicopress Tool

with *Three Grooves*

Accommodates Nicopress Sleeves

FOR COPPER

1 solid, 1 seven strand, 2 solid, 2 seven strand, 2 three strand, 3 solid, 4 solid, 4 seven strand, 4 three strand, 6 solid, 6 seven strand, 8 solid, 8 seven strand, 3 No. 10, 3 No. 8.

FOR COPPERWELD

4A, 6A, 8A, 6C, 8C, 6D, 8D, 9½D, 3 No. 10, 3 No. 12, 4 solid, 6 solid, 8 solid, 10 solid.

FOR ALL-ALUMINUM

2 solid, 2 seven strand, 4 solid, 4 seven strand, 6 solid, 6 seven strand, 8 solid.

FOR AMERDUCTOR

8SCP or SCG, 10SCP or SCG, 12SCP or SCG.

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Nicopress Sleeves and Tools Patented in U. S. and Foreign Countries. "Nicopress" Registered in U. S. and foreign countries.

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THE NATIONAL TELEPHONE SUPPLY COMPANY

Hazacord Portable Cable being used on a set of THE ROBE, a 20th Century-Fox Production in CinemaScope. Color by Technicolor.

HAZACORD STARS ON LOCATION IN HOLLYWOOD...

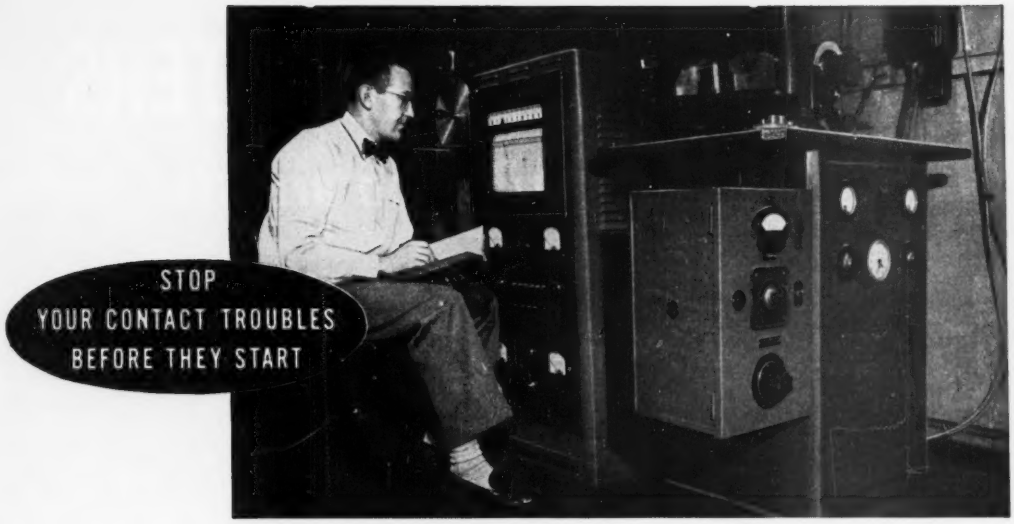
Here's another instance of Hazacord's ability to meet unusual service conditions. This is a special portable cable of three conductor flat parallel construction ordered for the set of THE ROBE at 20th Century-Fox Studios. Though subjected constantly to the rough treatment of hundreds of cars and trucks running over it, this Hazacord has shown little evidence of wear. That's because it's Hazaprene ZBF-sheathed for maximum toughness as are all Hazacord flexible cords and portable cables.

All Hazacords are so carefully job-engineered that they give the effect of having been built especially for *your* job. That's why it's a good idea to call in your Hazard representative to help select the Hazacord most suitable for your needs.

Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZACORD *Mold-Cured* portable cables

1868



X-ray diffraction equipment in the Mallory Contact Engineering Laboratory. It is so sensitive it will identify contaminating films of less than a hundredth of a micron.

Less Than a Hundredth of a Micron!

The slightest trace of contaminating films on contact surfaces can be identified by X-ray diffraction equipment.

In a contact, trouble can be a lot of things. The paper used in packaging, the type of glue on sealing tape, insulation on a wire, atmospheric conditions . . . are just a few of the many things that can deposit a contaminating film on contact surfaces.

Because we have the equipment to identify contaminating films, we can track trouble to the source and correct it. This same X-ray diffraction equipment is also used in the development of new contact materials, by identifying unforeseen formations that may develop during production processes. It is used in life test work to study gradual changes taking place.

This is but one example of the complete facilities that are ready to go to work on your contact problems . . . whether it is a simple button contact or complex contact assembly that is involved. If you would like to improve the contacts in your products or produce them at lower cost, get in touch with us at your first opportunity. Our engineers will be glad to talk to you . . . answer your questions.

Expect more . . . Get more from **MALLORY**

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Electrical Contacts and Contact Assemblies

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SERVING INDUSTRY WITH THESE PRODUCTS:
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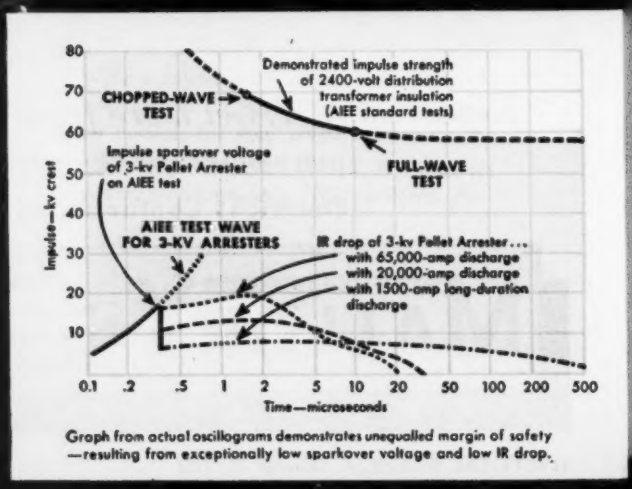
PELLET ARRESTERS

no other distribution arrester protects



Graph from actual oscillograms demonstrates unequalled margin of safety —resulting from exceptionally low sparkover voltage and low IR drop.

so well . . . . because **no other arrester**

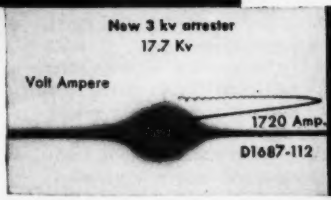
- **has such low impulse sparkover and low IR drop**
- **retains its protective characteristics for so long**
- **is so completely self-protecting against moisture**
- **is so universally applicable on all systems**

General Electric pellet lightning arresters assure the most complete and durable system protection available . . . enabling a new high in continuity of electrical service—at a new low in operating costs and maintenance of distribution systems. Whether lightning currents are high or low, with durations long or short, no other distribution arrester holds voltages to such low levels. And because it's a valve-type, the pellet arrester can be applied universally—on urban, rural or industrial distribution systems—no worry about available or future short-circuit currents, expulsion arc-flames, or high follow currents blowing fuses and depleting the arrester's life.

Remember also, pellet arresters are backed by *35,000,000 arrester-years of proved operation*—a service record unapproached by any other arrester. For complete information on G-E pellet arresters, available in ratings 1 kv through 15 kv, contact any G-E apparatus sales office, agent or distributor, or write for Bulletin GEA-2975. Address Section 432-4, General Electric Company, Schenectady 5, New York.

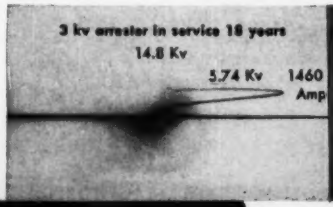
You can put your confidence in—

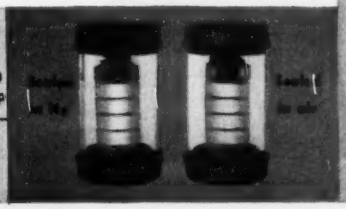
GENERAL ELECTRIC

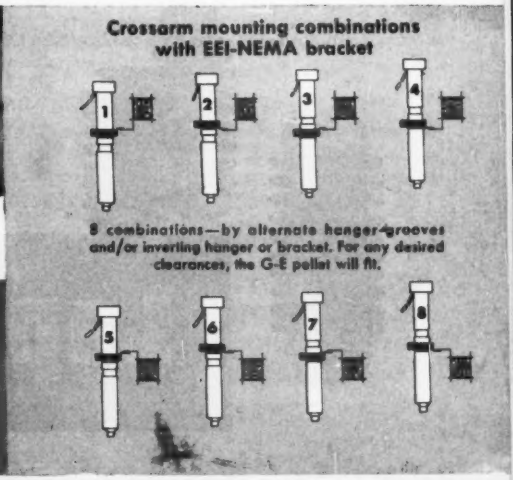


Oscillograms of performance of new and old arresters prove that the excellent protection by pellet arresters stays excellent.

Pellets unaffected by service moisture. Nitrogen-filled gaps exclude corrosive moisture—proved by life tests (below).





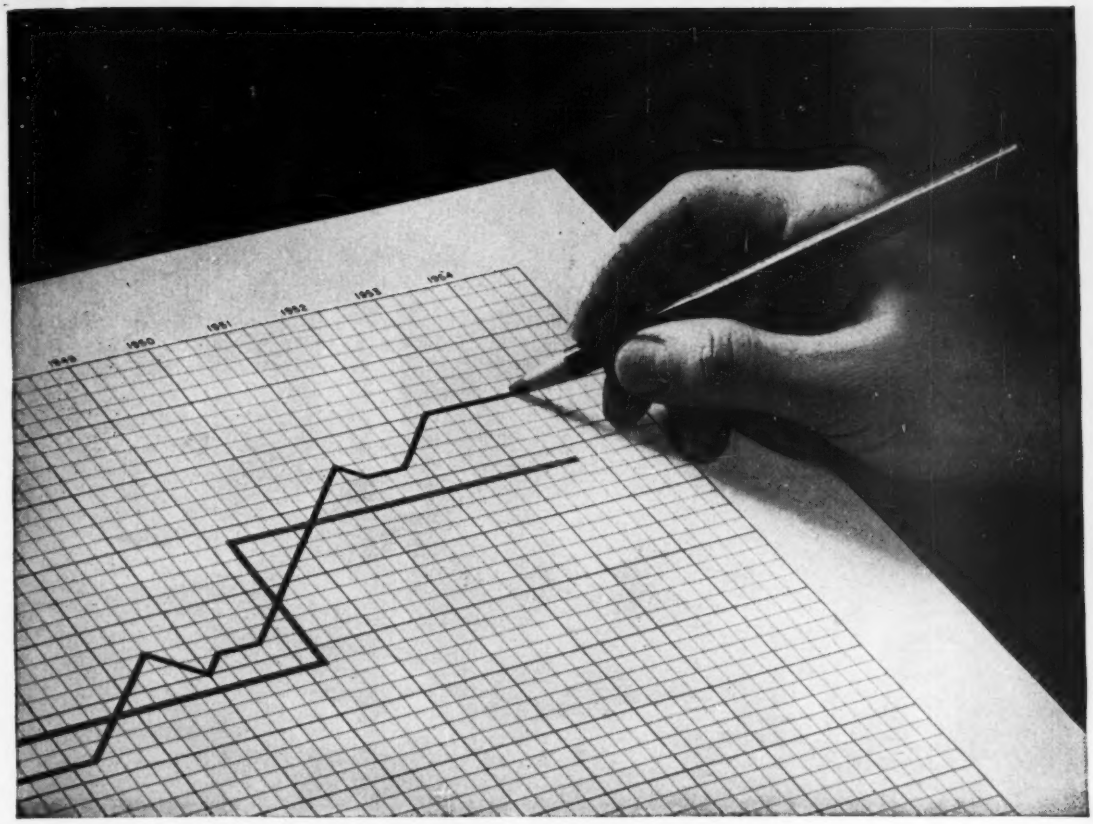


EVER GET COMPETITIVE BIDS ON LEAKAGE DISTANCE?

A quick measure of comparative effectiveness of insulators under contamination conditions is in *inches of leakage distance.* There are more important factors—some kinds of inches-of-leakage-distance are better than other kinds of inches-of-leakage-distance. But even on the simplest basis, the plain fact is that Lapp Fog-Type insulators—suspension types, Station Posts, Line Posts, even small one-piece pin-types—provide more leakage distance than conventional types . . . and that leakage distance costs *less per inch.*

There's more . . . about *uniformity* of leakage surface and the hazards of narrow shielded hot-spots—about surfaces exposed to wetting and the cleansing action of wind and rain. If steadily increasing industrial contamination is threatening leakage current flashover on any of your system . . . if you're paying 1953 labor rates for changing out or washing insulators . . . there's important money to be saved by your company, if you'll let us tell you the Lapp Fog-Type story—and about Lapp Fog-Type insulators for all line or station requirements.

Lapp Insulator Co., Inc.,
Le Roy, New York.



Caution: dangerous curves

Keeping your fire protection properly balanced with changes in processes as well as ups and downs in production is vital to efficient, profitable operation.

You'll find your best answer to this serious fire problem which is currently confronting industry by installing an expansible, fully approved C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing System. Simple piping, running from one centrally located storage tank, instantly transports clean, non-damaging, non-conducting carbon dioxide anywhere in the plant area. Fire at any protected location is extinguished in seconds with an absolute minimum of expense and interruption.

Changes in your fire protection requirements are easily and economically provided for with a C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing System by initially installing an oversized storage tank and adding where necessary the supplementary discharge facilities at a later date.

Flexibility is the keynote . . . the low pressure carbon dioxide storage tanks range in capacity from one to fifty tons . . . discharge facilities can be either manual mechanical, manual electric, automatic mechanical, automatic electric or a combination of these . . . especially installed to fit your particular needs.

WHEN BUSINESS STOPS . . . INCOME STOPS!

Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today...our extensive experience over the years is at your disposal without obligation. Get the facts now!

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MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
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Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
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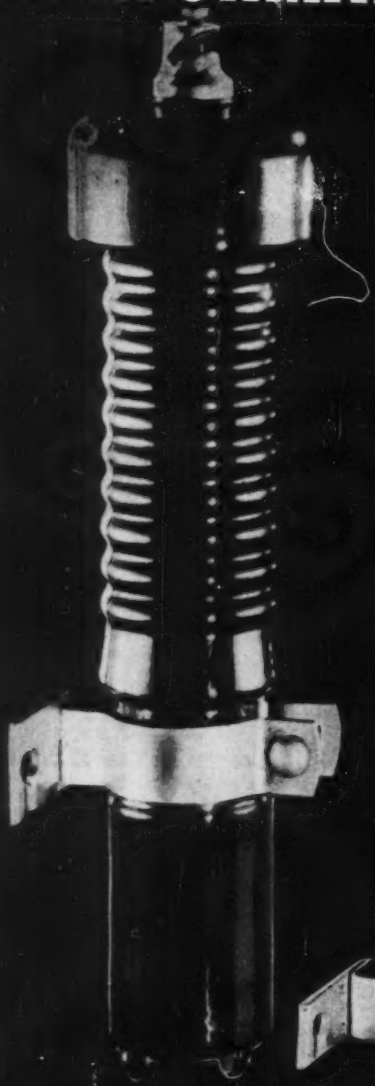
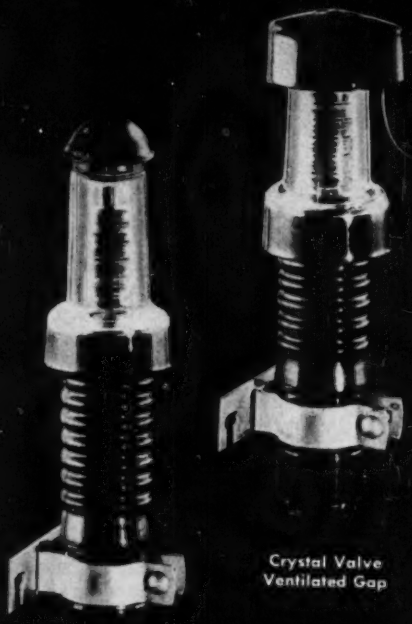


Crystal Valve
Porcelain Body Types



Crystal Valve
Ventilated Gap

Crystal Valve
Ventilated Gap

Crystal Valve
Glass Body Type

ELECTRIC SERVICE MANUFACTURING CO.

r POWER PROTECTION

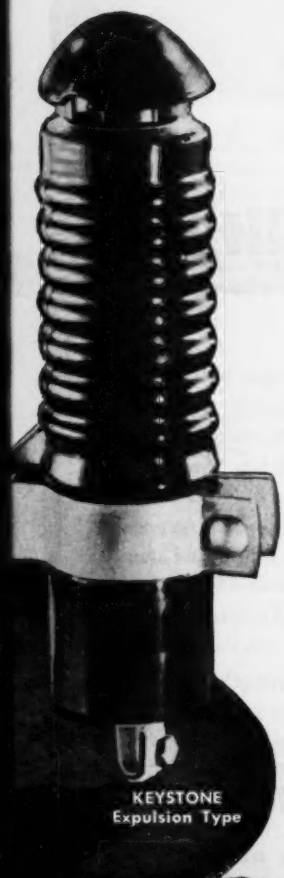
CRYSTAL VALVE

THE MULTI-PURPOSE ARRESTER

Millions of Crystal Valve Arresters, on all types of installations and under every kind of adverse lightning condition, have achieved an unsurpassed performance record all over the world.

Accurately spaced high-speed multiple spark gap elements, with smooth, flat arcing surfaces, insure low impulse spark-over. Oxidized silicon carbide valve element guarantees fast surge voltage reduction, low IR voltage and quick suppression of follow current. Non-deteriorating . . . no radio interference . . . moisture-proof.

Crystal Valve Ventilated Spark Gap Arresters have scored better than 99% perfect in operational rating over the past 16 years. Glass body for gap housing makes inspection easy. Vents permit free air circulation, prevent corrosion.



KEYSTONE EXPULSION TYPE

IDEAL FOR RURAL LINES

The parallel discharge paths found only in the Keystone Expulsion Type Arrester make it particularly suited to rural circuits. Low impulse spark-over voltage means maximum safety to transformer insulation. Extinguishment of follow current flow is so rapid that line voltage disturbance rarely occurs.

Rugged construction assures long, trouble-free life. Ventilated body guarantees dryness at all times.

Write today for latest technical data on Crystal Valve or Keystone Expulsion Arresters. No obligation.

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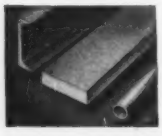
Responsibility...
and a fist full of books!

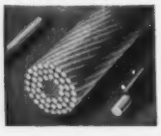
Alcoa currently publishes hundreds of booklets and pamphlets—over twenty-five dealing with aluminum electrical conductors alone. Their subjects range from products to procedures, their titles from *Aluminum Bus Conductors* to *Voltage-Drop Charts for Insulated Aluminum Cable.* You'll see them on the desks of men in all phases of the electrical power industry.

At first blush, publishing seems a far cry from the aluminum conductor business. For many companies, it is; but not for Alcoa. This technical literature is the printed product of Alcoa's sense of responsibility toward customers. A responsibility to help them make the best use of the best product. A responsibility we assumed when we introduced aluminum electrical conductor over 55 years ago. Aluminum Company of America, *2100-Z* Alcoa Building, Pittsburgh 19, Pennsylvania.

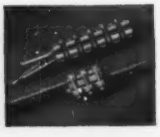
Alcoa Aluminum Bus Conductors are available in rectangular bars, solid round bars, channels and tubular shapes.



Alcoa Aluminum Electrical Conductors include Aluminum Cable Steel Reinforced, solid and stranded aluminum wire, bare and covered.



Alcoa manufactures aluminum accessories correctly designed for use with aluminum conductors.



Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA

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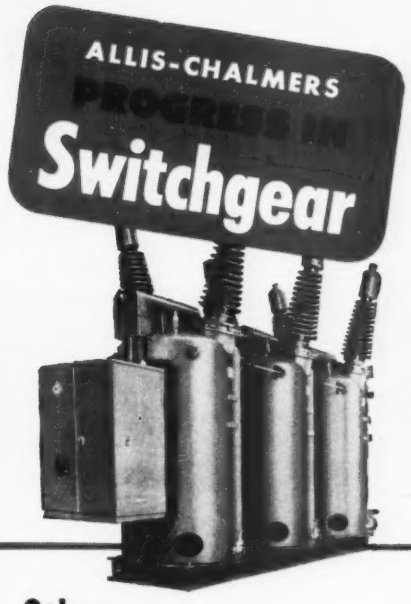
RELIABILITY

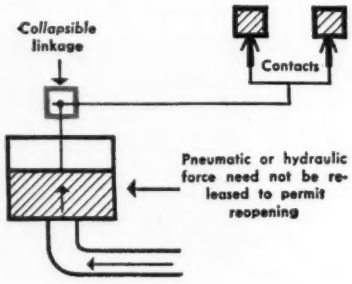
In Large Circuit Breaker Operation Depends Upon

THIS BASIC DIFFERENCE



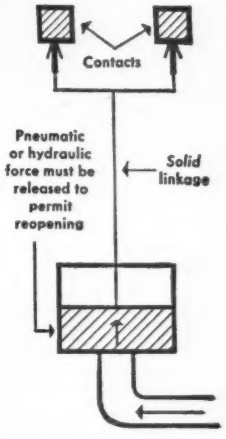
Allis-Chalmers *Mechanically Trip-Free* Mechanism

When opening after closing against a fault, the Allis-Chalmers operating mechanism does not require dumping of oil or air pressure. Trip coil simply releases a latch and the closing linkages collapse, allowing contacts to open at full speed. Operation is fully mechanically trip-free.



Other Operating Mechanisms

Air or oil pressure used to close contacts must be dumped — fast—to permit contacts to open. To do this takes a whole sequence of devices, including valves and solenoids. Everything must work perfectly. Otherwise breaker will be held closed or slowed in opening.



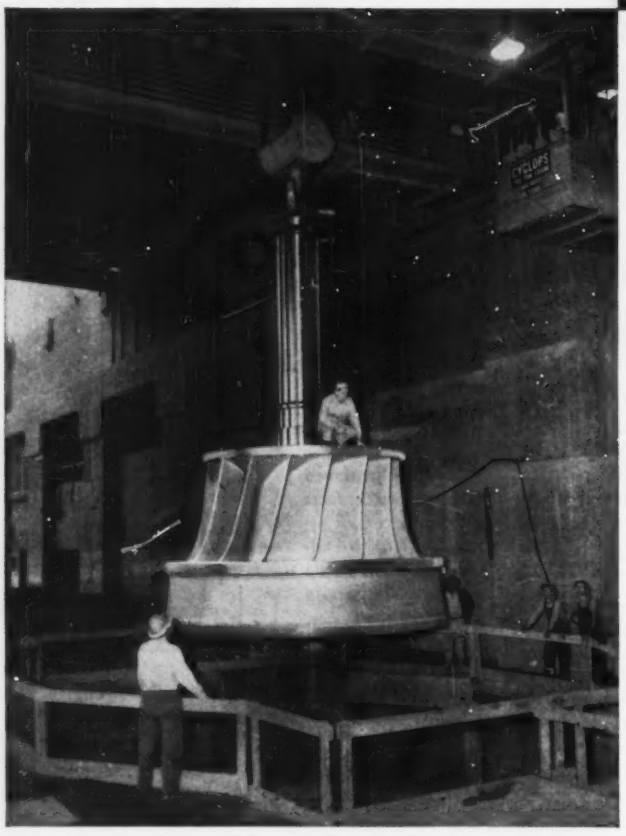
Opening the breaker when it closes against a fault, regardless of the position or condition of the closing mechanism, is the protective function of the breaker. To be fully protective under all circumstances, every one of your breakers should have a fully mechanically trip-free mechanism. For further details on what mechanically trip-free operation means to you, call your nearby Allis-Chalmers District Office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4166

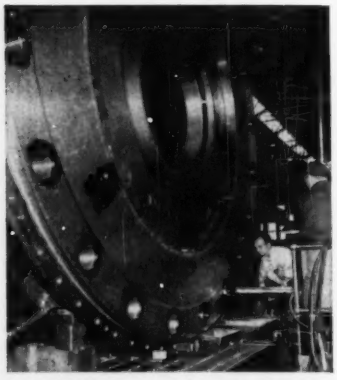
ALLIS-CHALMERS

FOUR 17,000 HORSEPOWER BALDWIN FRANCIS TYPE TURBINES INSTALLED AT FORT GIBSON

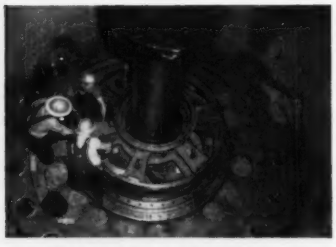
FORT GIBSON DAM—This view shows (center of photo) the powerhouse in which these turbines are installed.



BALDWIN FRANCIS TYPE TURBINE RUNNER AND SHAFT shown above being lowered into position at Fort Gibson. The total weight of these two parts is 110,400 pounds.

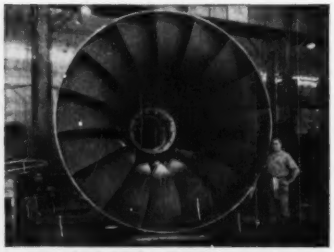


TURBINE MANUFACTURING requires lots of big, precise machine tools to handle the machining of large head covers such as the ones used at Fort Gibson.



THE HEAD COVER, MAIN BEARING AND MAIN SHAFT are shown in the above photo. The workers are busy positioning the guide bearing.

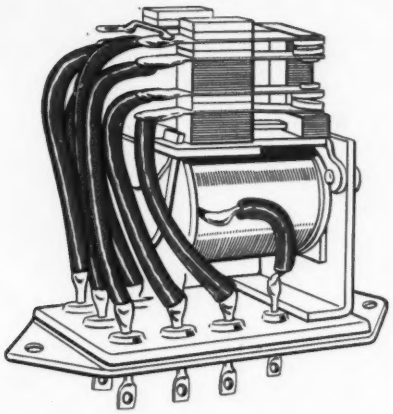
One of the foremost in the design and manufacturing of hydraulic turbines for over 100 years, Baldwin-Lima-Hamilton, together with its subsidiary, the Pelton Water Wheel Company, is among the few firms in the country with the facilities and experience required to produce such important equipment.



DISCHARGE END OF THE RUNNER is shown in this shop view prior to being shipped to the powerhouse site.

BALDWIN-LIMA-HAMILTON

Philadelphia 42, Pa. • Offices in Principal Cities



A Price Electric Corporation, Frederick, Maryland relay, series 6000HS, shown at actual size, without its protective cover. Illustrated in red is BH "1151" used to insulate connecting leads, shunts and pigtails.

1¢ *lengths* of BH "1151" ..no failure after 18 months

Price Electric Corporation, producers of magnetically operated relays for electronic equipment, radar, and guided missiles use BH "1151" Silicone Rubber Fiberglas Tubing to save dollars, save time, save relays.

Here's what they say — "We needed a thin-walled tubing with high electrical resistance, for sealed and unsealed relays. BH "1151" was chosen specifically for high temperature applications in ambient temperatures of 125°C, and above. Continuous relay type tests have been run under cycling temperature conditions for more than a million operations. There have been no failures in BH "1151" since the test program was started a year and a half ago.

"With BH '1151', overall economy has resulted from minimum losses in cutting, handling and installing. Time is saved because of the tubing's uniform high quality. Cut ends don't fray. Smooth bore BH '1151' slips easily over leads. Rejects in inspection and test for hipot are almost non-existent. Assembly damage is negligible."

BH "1151" may be the electrical insulation you're looking for. This union of two great inorganic materials — braided Fiberglas and Silicone Rubber — is inherently flexible. It has no plasticizers or solvents to "sweat out". It will not support fungus growth. It will not craze or crack. It remains unchanged through continuous operation at temperatures from —90°F to 400°F. Its thin-walled flexibility speeds installation and offers new design freedom while providing complete product protection.

BH "1151" is just one of a large family of tubings and sleevings that have solved many electrical insulation problems. If you'll send facts on your requirements — voltages, temperatures, unusual conditions — we'll make recommendations and send you samples for testing.

Bentley, Harris Manufacturing Co.
1112 Barclay St.
Conshohocken, Pa.

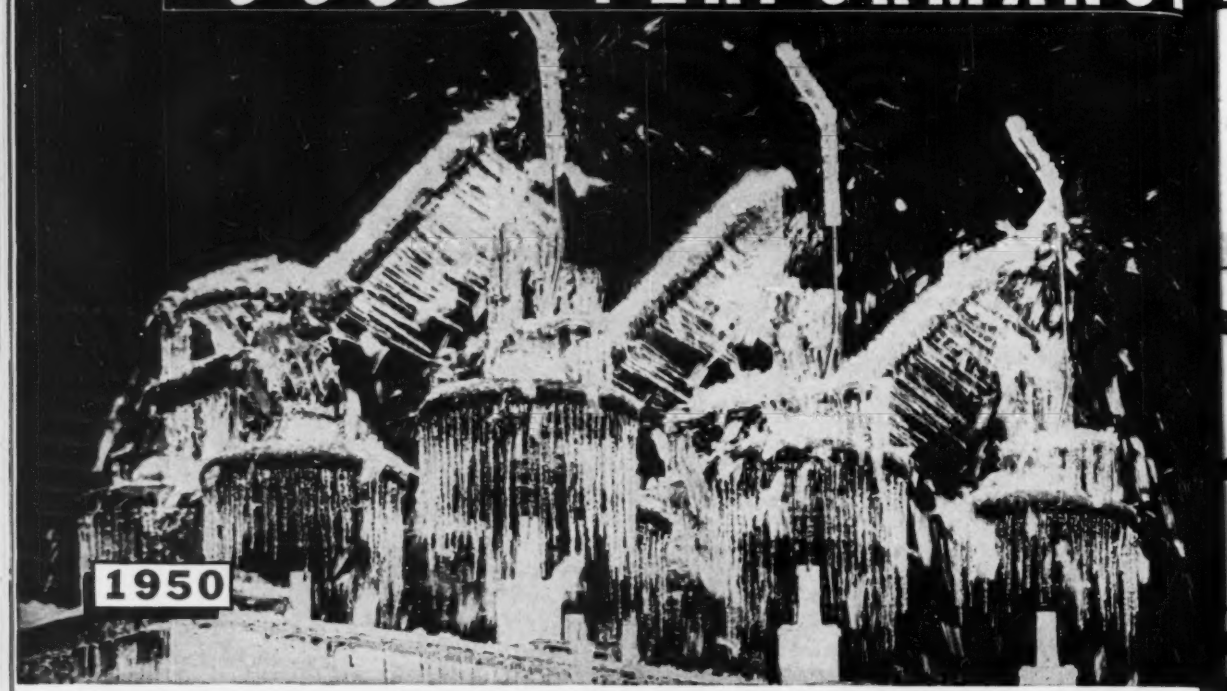
BH FIRST IN

use of Fiberglas
heat-treated Fiberglas
true high temperature flexibility
vinyl-coated Fiberglas
silicone rubber coating
colors in silicone rubber
true Class B (130°C.) protection

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

GOOD PERFORMANCE



TESTED! PROVED! Since 1922

Ice-Testing is not new to R&IE switches. Many years ago, the freezing of spray-covered equipment was no longer an experiment.

In the 1930's, R&IE began to control the conditions of ice-testing - the approach to finding the true answer to switch performance. In laboratory testing, practically any rate of freezing precipitation, any variation of temperature - from open to closed, or closed to open operations can be duplicated.

Since 1922, Hi-Pressure Contact Switches have bee consistently tested under practically every ice loadin condition. Jaw clearances, crank clearances, ope areas in clevis joints, no operating parts in compre sion, short operating radii and movable parts in shea are some of the detail advantages proven in the ma ice-breaking tests for better operating service.

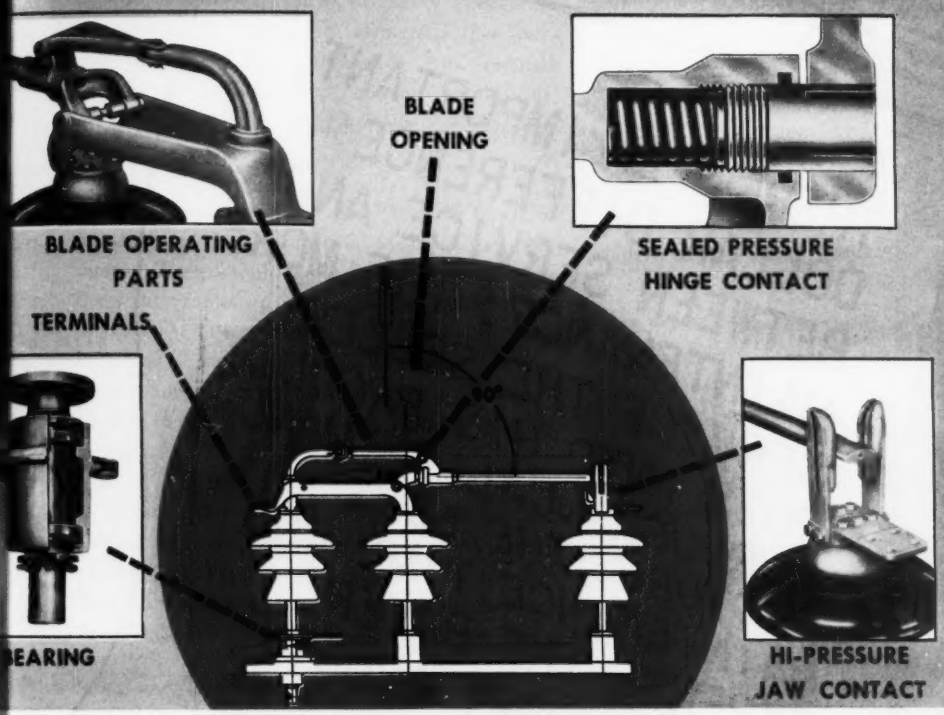
R&IE

31 YEARS OF KNOW-HOW

Year after year, test after test added to the vast store of knowledge gained in the preceding years of switch building Know-How. Along with ice-breaking, hundreds of other thermal and mechanical tests are on the record in the development of Hi-Pressure Contact Switches. Fault current tests, impulse tests, wear tests - and any method of research to improve the switch design - all contribute to Good Switch Performance.

RECORDS START WITH

R&IE Basic Design SINCE 1922



THE MODERN TYPE TTR-49 SWITCH IS DEVELOPED FROM THE R&IE BASIC HI-PRESSURE CONTACT DESIGN

✔ Check the facts...

1 JAW CONTACT - Hi-Pressure, Hi-Thermal capacity silver to copper contact. ONLY ONE BREAK CONTACT on the switch. Copper and beryllium jaw - copper for thermal capacity and beryllium for strength and resilience. Here's maximum protection against fault current damage.

2 HINGE CONTACT - Completely enclosed and weather sealed Hi-Pressure, Hi-Thermal capacity, silver to copper Hinge Contact. Continuous, annular constant electrical and mechanical contact at all times. Eliminates second break contact with its multiplied problems and maintenance.

3 BLADE OPERATING MECHANISM - Simplified and "streamlined" to attain a simple harmonic, accurately controlled blade motion. Special pin fastenings, snap rings, and rivets have been eliminated from moving parts. Universal blade balance on 69 Kv, and above.

4 BLADE - Extra heavy, hard drawn tubular copper with integral, formed contact end. Solid current path from jaw to hinge contact.

5 TERMINALS - Four half-inch bolts on 1¾ x 1¾ inch centers permit NEMA standard 600 or 1200 Ampere clamping and R&IE Type "UC" universal clamps. Both terminals equal height from base.

6 BEARING - Aluminum housed, weather sealed, stainless ball - requires no lubrication.

R&IE SWITCHING EQUIPMENT
DIVISION OF I-T-E CIRCUIT BREAKER CO.
GREENSBURG, PA.

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES
INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

KERITE
CABLE-GRAM
THERE'S AN IMPORTANT DOLLAR DIFFERENCE BETWEEN SERVICE AND MAINTENANCE: THE MORE SERVICE THE SELLER PUTS INTO HIS PRODUCT THROUGH QUALITY MANUFACTURE, THE LESS MAINTENANCE TIME AND EXPENSE THE BUYER HAS TO WORRY ABOUT.
THE VALUE AND SERVICE LIFE OF A PRODUCT CAN BE NO GREATER THAN THE INTEGRITY AND CRAFTSMANSHIP OF ITS MAKER.

DAYS KERITE

KERITE CABLE

THE KERITE COMPANY
30 Church St., N. Y. 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago;
582 Market St., San Francisco;
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31 St. James Ave., Boston

Review and Renew Efforts

The outstanding results of utility operations during 1953 are unfolded throughout this year-end issue of Electrical World. New records abound in load growth, capacity added, improved efficiencies, engineering accomplishments, and earnings.

Members of the utility family at all levels of management should be proud of the accomplishments. They should gain great encouragement from the results in all the various fields of endeavor. Members of the industry should also be proud of the federal and state authorities who have made great strides in taking a fairer approach to their power activities and regulatory matters.

Unfortunately success often precedes complacency. And complacency is a disease that an important industry cannot tolerate. Even the lack of a persistent urge for improvement in any unit of an industry cannot but reflect upon the whole.

In reviewing the accomplishments of 1953, each unit of the industry will want to consider where it was below par. Proof of lack of complacency shows up in the degree of management attention to potential weaknesses.

Results of operations showing up in recent earnings reports attest to progress in load building, reducing generating costs, and increasing rates, and to the resultant gain in net income. But can the same be said of other areas of management responsibility.

Can the industry say that adequate attention is being given to the study of management organization and functions?

Are there sufficient incentives to compel good performance by executives and other management men?

Are the methods and tools of management as modern as they should be?

Is performance measured scientifically if at all?

Are plans being made now for the problems ahead growing out of:

1. Lower rate of growth over the next two years?

2. Heavy unit loads in individual residences and commercial buildings?

3. Obsolete distribution systems?

4. Need for greater reliability of electric service?

These points are but samples of the many fields for management study. They are fields in which much room is to be found for further improvement and economies.

A review of 1953 should have the salutary effect of stimulating renewed efforts toward more gains in 1954.

For the World and U. S. Industry

President Eisenhower's speech to the United Nations offering U. S. participation in a program making nuclear fuels available around the world has import for utilities. This is true even if the actuation of his proposed stockpile distribution is delayed long after Congress considers the modification of the McMahon Act. The mere willingness to share our accumulation of the fuels with other nations is an acknowledgement that controls can be devised to keep the use of the materials confined to peacetime purposes.

If there is hope that such controls can be framed to be effective with other nations there should be several times as much confidence that controls can be devised for application within the U.S.A. Having thus tempered the fear that subversive interests would divert some of the fuel from amounts allowed to power companies, the main remaining reasons delaying relaxation of the McMahon Act are economic in nature rather than legislative or regulatory.

To twist the argument slightly into a different channel the question arises whether boosting the economic productiveness of backward nations is not just a matter of creating competition for our American industries. We have our standard of living because we manage to keep a few jumps ahead of the rest of the world in productivity. Therefore, a boost must be given simultaneously to American industry. So no matter how one looks at it, the Eisenhower speech can hardly be detrimental to the cause of private cultivation of atomic energy under restrictions and controls that will safeguard the nation's security requirements.

Distribution Is Different

In area planning alone does distribution engineering ordinarily approach the pattern set for generating stations and transmission systems. Planning determines which subtransmission and primary distribution voltages best suit system needs. It establishes the optimum design and locations of substations to feed the distribution load. And it sets the pattern by which these elements are integrated into a system.

Rare, indeed, is the distribution project which can command specific and detailed engineering analyses like those for large, efficient generating units. For these, engineers select the sites, specify steam conditions, machine efficiencies, and all the other ingredients of overall station economy. But distribution must deliver electricity to customers at the locations and time selected by them. These requirements limit most line extensions to scattered increments often built with considerable urgency. Cost is inherently high because of the high ratio of labor to material, and economical scheduling is difficult.

The distribution engineer's solution must provide standardized construction units designed for a minimum of labor after the poles are erected. He must devise faster, more economical methods for setting poles and stringing wire. And he must satisfy the demand for complete operating and inventory records with the minimum clerical and technical manhours. A well-known engineering executive has said, "Distribution depends upon the engineer's ingenuity for economy and efficiency."

But the distribution engineer has still another responsibility. More than any other engineer in the plant organization, he has the duty to provide customers with reliable electric service. This he must accomplish with a far-flung network of poles and wire, manholes and cable, transformers and cutouts, switches and meters. The heterogenous collection of stations and lines which comprise his plant must be amalgamated into a dependable, smooth-operating system which meets the measure of reliability.

Yes, distribution is different. It sprawls across the nation with untold millions of poles and astronomical quantities of other components. Because of this vast expanse, distribution must be engineered in terms of area planning, standardized components, and coordinated operation.

All-Electric Home Includes Heating

"Go All-Electric!" is a rousing slogan calculated to inspire great enthusiasm in the collective bosom of the electrical industry. But—

"Never!" shouted the captain of HMS Pinafore.

"What? Never?" asked his doughty crew.

"No, never!" responded the captain, stoutly.

"What? Never?" again chorused the crew.

To which the captain replied, "Well, hardly ever."

"Go all-electric," the slogan rings.

"All-electric?" comes the question.

"Yes, all-electric," the words are repeated.

"All-electric?" again the question, with heavy accent on "all."

And to this there is no other answer than, "Well, partly electric."

Wait a minute, though. There is another answer. It will be found by those who look on page 100 of this issue of Electrical World. Here the American Gas & Electric Service Corp announces that AG&E power companies will actively encourage the use of electricity for house heating as a move towards the all-electric home.

Job Enlargement Beats Assembly Line

Often there is a big difference between theory and practice. Theory has it that the efficient way to get things done is to divide a job into its component operations and then employ assembly lines. But practice at Detroit Edison Co brought out the difference.

The Detroit utility had practically reached perfection in putting its billing department on assembly line operation. But the results kept getting worse. Employees were getting less efficient. Absenteeism kept increasing. Work was falling behind more and more. So because Detroit Edison has wise management, it decided to make an investigation. What it discovered should be of value to all other electric utilities.

A study proved that assembly line work was too monotonous. The solution was to adopt a plan which the company calls "job enlargement." Now one employee no longer performs one simple billing operation. Instead each employee performs several. And contrary to beliefs of efficiency engineers the work is being done more quickly and better. What is more, the extra workers the company thought it required to get the work done on time are no longer thought of.

For other details of Detroit Edison's experience see the next issue of Electrical World.

THE ELECTRICAL WEEK

The Issue's News Highlights—The utility industry continued to make great strides in expansion of facilities and service to customers, EEI's Sammis declares . . . Pennsylvania W&P loses appeal in damage suit against Consolidated Gas Electric Light & Power of Baltimore.

American electrical manufacturers ask for protection against imports of foreign electric equipment . . . J. Frank Ward is named managing director of Washington State's new power commission . . . John Peters wins AIEE's Edison Medal . . . TVA will conduct studies on atomic reactor plants . . . Washington State witness testifies at Hells Canyon hearing.

Five Pacific Northwest power companies filed an application with FPC asking preliminary permits to investigate developing 536,000 kw of hydro power at Bruce's Eddy and Penny Cliffs on branches of the Clearwater River in Idaho. Companies involved are Portland General Electric, Pacific Power & Light, Mountain State Power, Washington Water Power, and Montana Power.

Dr. Paul J. Raver was approved unanimously as superintendent at Seattle City Light by the Seattle City Council. In a hearing before the action was taken, he declared he plans no changes in policy or staff reorganization.

Georgia PSC asked Florida Power Corp why it should not sell Georgia P&L to Georgia Power Co for a fair value or why GP&L should not be made a separate and independent operating utility; why GP&L should not buy its power from GPC; and why GPC should not sell power to GP&L at its low rate schedule. PSC scheduled hearings on the questions for Feb. 2.

Brazilian government is preparing a plan for establishment of an electric company, "Electrobras." It would provide capital for construction of power plants in the country's states and municipalities.

Tex-La Electric Co-operative was organized by five co-ops and two cities to buy and distribute hydro power in Louisiana and east Texas. Directors, headquartered in Lafayette, La., said the corporation planned to negotiate with Southwestern Power Administration for purchase of about 75,000 kw. They predicted membership in the cooperative would increase to 25 within six months and to 50 within a year.

Tacoma City Light's right to build two hydro dams on the Cowlitz River was upheld by the refusal of the Washington State Supreme Court for a rehearing. The court stood by its 6 to 3 decision of Oct. 14 that the city has a valid license from FPC to build the dams.

California Electric Power Co, after seven years with a union shop, has signed a new open shop contract with Local 47, IBEW-AFL. The contract, retroactive to Dec. 1, gives a 5¢-an-hour wage boost, and an additional 5¢ an hour for employees required to climb poles or structures, limited double-time for emergency call-outs, and other improvements.

Off the Washington Wire . . . REA denied any slowdown on farm electrification loans, noting that loan approvals for the July-October period this year was only slightly below the same period last year and higher than for similar periods in 1950 and 1951.

Dean of the FPC, Claude L. Draper, was reelected unanimously to serve as vice chairman of the commission during 1954.

Using the "separable costs-remaining benefits" method, FPC has allocated $283,201,600 of the total investment of the McNary project to power for rate-making purposes. Total estimated investment of the project is $309,015,400. This was an interim finding subject to revision when final costs are available.

FPC has authorized merger of Northern Wisconsin Power Co into Lake Superior District Power Co. Application for the merger said benefits to Northern Wisconsin's customers would include an immediate net rate reduction of around $7,550 per year.

Cleveland Electric Illuminating Co bought the distribution facilities of Euclid-Doan Power Co for around $175,000. The latter is a 47-year-old company that serves some 400 commercial and residential customers on Cleveland's east side. It had been buying its power from Ceico.

California-Pacific Utilities Co electric properties that Oregon's Union County Utilities District seeks to buy were valued at $3,580,405 by a U. S. Federal Court jury. The evaluation excludes cities of Elgin and Island City, where voters have rejected efforts of the PUD to include them in the district. Union County PUD now needs voter approval of bonds to conclude the transfer.

Eugene (Ore.) Water Electric Board filed a condemnation suit against Mountain States Power Co to acquire distribution lines in the Willakenzie and Glenwood districts near Eugene. The Board offered to pay $1.35 million. Mountain States has 20 days to reply.

Tennessee Valley Authority said its power system established a new national record on Dec. 17 when it hit a peak load of 5,057,000 kw during hour ending 6 p.m. Officials said it is the first time any U. S. power agency has exceeded a peak load of 5 million kw.

City Commission of Fernandina Beach, Fla., passed an ordinance providing for an 10% tax on electricity, metered gas, water service, and local phone service.

Executive Changes . . . William B. Tippy, vice president of Commonwealth Services, Inc. was elevated to executive vice president . . . William H. Draper, Jr, former U. S. special representative in Europe for Mutual Security Agency, is slated as executive officer and board chairman of Mexican Light & Power Co, Ltd, Mexico City, to succeed retiring George S. Messersmith . . . R. B. Sayre, assistant vice president of Graybar Electric Co, was named a vice president of the company.

EEI Pres Walter Sammis

sums up the electric utility industry's activities in '53 and reports utilities set records in

- **Power generating additions**
- **Construction expenditures**
- **Financing**

The Industry's Performance in 1953

The electric utility industry in 1953 continued to make great strides in expansion of facilities and service to customers, Walter H. Sammis, president of Edison Electric Institute, reported in a summation of the achievements of the industry over the past 12 months.

The EEI president, who also is president of Ohio Edison Co, noted that the electric utility industry racked up a number of new records in 1953. Construction expenditures of investor-owned companies, he said, were higher than ever before and new power generating installations also were greater than for any other year. And sales of common stock exceeded those previously in a year when financing by the utility companies was at a record-breaking level.

High level of electricity output and revenue in the past 12 months were particularly outstanding, Sammis said.

Biggest Problem . . . On the other side of the picture, Sammis declared that the biggest problem facing the utility industry is the "inroad that government proprietary operations are making in our business." He called government proprietary operations a threat to all private enterprise, and stressed the tax advantage enjoyed by government enterprises. If government is going to compete with business, he added, its businesses should be operated on the same basis as private business and should not be permitted to base its prices on subsidized costs.

The Industry's Performance in '53 . . . Some of the statistics presented by Sammis on the electric industry's performance in 1953 are summarized below:

- Total generation of electricity in U. S. was 513 billion kwhr. Of this amount the electric industry (public and private) produced 442 billion kwhr, up 43 billion from 1952. Industrial and railway plants turned out 71 billion.
- One million four hundred thousand new customers were added by all segments of the electric industry bringing the total to 49.9 million.
- Average revenue per kwhr sold to domestic customers dropped slightly from 2.77¢ in 1952 to 2.75¢ this year. This, said Sammis, indicates "possibility of a leveling off of the industry's historic downward price curve for electricity for residential use."
- In 56 actions by regulatory commissions, 35 applications for power rate increases were approved, 15 are pending, and 6 were withdrawn or denied.
- By the end of 1953, slightly more than 5 million farms had electric service, 93% of the overall farm figure. All but 2% of the nation's occupied farms either have service or have it readily available.
- Sales by the utility industry totaled a record 382 billion kwhr, an increase of 11.5% over 1952.
- Capability installations ,totaled a record 9.2 million kw. Of this amount 6.9 million kw was installed by investor-owned firms and the remainder by co-ops and government agencies. Total generating capability of the industry stood at 93.5 million at the end of 1953. Total scheduled construction for the entire utility industry in 1954 was placed at 14.1 million kw.
- Expenditures by private companies in 1953 for construction totaled $2,850,000,000. The 1954 construction budget is $3 billion.
- Money obtained to finance the '53 construction program of electric companies totaled $2,850,000,000, nearly $2 billion of which was obtained from sales of securities and the remainder was drawn from depreciation reserves and surplus accruals.
- Gross revenues of investor-owned electric companies rose 9.5% over the 1952 level to $5,940,000,000. Net in-

come rose 9% to $1,045,000,000.

• Taxes—federal, state, and local—paid by electric companies amounted to $1,338,000,000, an increase of 9.3% over 1952. Wages and salaries paid by the companies totaled $1,157,000,000, up 6.6%. Fuel costs were $1,025,000,000, up 11.5%.

• Coal consumption per kwhr generated declined from an average of 1.097 lb per kwhr in 1952 to 1.065.

Penn Water Loses

Appeals Court affirms earlier ruling dismissing damage suit against Baltimore firm

U. S. Court of Appeals for the Fourth Circuit on Dec. 16 unanimously affirmed the action of U. S. District Court for Maryland in dismissing by summary judgment the suit of Pennsylvania Water & Power Co against Consolidated Gas Electric Light & Power Co of Baltimore. In the suit Pennsylvania W&P claimed approximately $18 million treble damages under the Sherman Antitrust Act.

Contract Dispute . . . The suit arose out of a contract between Penn Water and Consolidated Gas Electric L&P entered into in 1931. Under the terms of the contract Consolidated bought power from Penn Water. In 1946, Federal Power Commission began rate proceedings against Penn Water which resulted in an order in 1949 reducing Penn Water's annual income under contract by over $1.7 million.

At about this time Penn Water repudiated the 1931 contract and secured court invalidation of it on the ground that it violated the antitrust laws. The utility then sought to have the FPC rate reduction order annulled. In 1951 Supreme Court sustained the FPC order.

Brings Suit . . . Penn Water then sued Consolidated for treble damages under the antitrust act, claiming that it had been prevented by Consolidated, under the contract, from erecting a steam-electric plant. The District Court dismissed this action on the ground that Penn Water was enjoying the benefits of the contract and requiring its performance at the time it sustained its alleged damages and as a party to the illegal contract could not recover.

Ask Protection Against Imports

General Electric and Westinghouse call for curbs on sale of foreign electrical equipment in the United States

Separate calls for protection against domestic competition by foreign electrical manufacturers have been issued by General Electric Co and Westinghouse Electric Corp.

In a special year-end meeting with reporters, Philip D. Reed, chairman of GE's board, said that foreign competition "should not be permitted to enter this market at prices so low that no American producer can meet it."

He was seconded by Gwilym Price, Westinghouse president, who warned against any further general reductions in U. S. tariffs, which, he said, "could seriously affect many industries, large segments of labor and agriculture, and entire communities."

Lower Labor Costs . . . Reed emphasized that labor costs as much as 90% lower than those prevailing in the U. S. enabled foreign makers of heavy electric equipment to undercut domestic producers.

He added that the differential is no handicap in home appliances and other mass-produced consumer items, but in the field of turbines, generators and other large industrial equipment, U. S. producers cannot compete because careful hand work is essential.

"In these specific cases, something should be done to equalize the competition," Reed asserted.

Specific Example . . . Reed was supported by GE President Ralph Cordiner, who asserted that in heavy duty equipment "60 to 70% of the total cost is labor" and that European labor costs "are much more than 25% cheaper than in the U. S."

Cordiner pointed out that the very

CIO-AFL Heads Sign a No-Raiding Pact

Officers of Congress of Industrial Organizations and American Federation of Labor put their signatures on a no-raiding agreement earlier this month. Pictured left to right are: William Schnitzler, AFL secretary and treasurer; George Meany, AFL president; Walter Reuther, CIO president; and James B. Carey, CIO secretary and treasurer and president of International Union of Electrical Workers.

At the time the new pact was signed, the union leaders discussed ultimate merger of the two major labor federations.

The no-raiding agreement does not bind any international union or affiliate unless it signs. CIO announced that it had authorizations to sign for 98% of its membership and Meany said that all AFL affiliates eventually will sign.

day of the press conference (Dec. 16), GE lost out to a British concern on a contract to provide water wheels worth $3 million to $4 million for the McNary Dam on the Columbia River. English Electric Export and Trading Co won the contract to furnish and install two 73,684 kva generators at McNary on a bid of $3,651,476. General Electric was the low American bidder with $4,292,701. Three other U. S. firms also entered bids.

On the price bid, the foreign firm was 21% below the lowest American bid. But under the evaluation made by the Army Corps of Engineers, the foreign firm was only 19% below the GE offer (see table).

In evaluating the bids, the Corps considers the maximum cost of the equipment under the labor and material escalator clauses in the contracts, efficiency of the equipment, cost of spare parts. Tariff, which would amount to approximately $422,000 on the English bid, is included in evaluating these bids. Since this duty eventually comes to government coffers, the savings in awarding the contract to the foreign firm would amount to more than $1 million.

Company Agreement . . . This view was given added emphasis last week by Westinghouse President Price who pointed out that those who are currently advocating "trade not aid" are also advocating that U. S. industries which are affected should be subsidized.

Price based his observations upon an analysis of recent reports on the foreign trade position of the electrical manufacturing industry, just completed for Westinghouse by O. Glenn Saxon, noted international economist and professor at Yale University.

Saxon recommended elimination of imports on electrical goods vital to nation's economy and security and selective tariffs on other goods.

FIRM	PRICE BID	EVALUATED BID
English Electric	$3,651,476	$3,984,051.20
General Electric	4,292,701	4,771,517.60
Westinghouse	4,343,602	5,114,522.40
Elliot Co.	4,494,954	5,393,944.80
Allis-Chalmers	4,734,461	5,681,353.20

J. FRANK WARD

Tacoma's Ward . . .

. . . named first managing director of Washington State Power Commission

J. Frank Ward, superintendent at Tacoma City Light since 1947, has been appointed the first managing director of the Washington State Power Commission, authorized by the 1953 state legislature. It was organized recently with Walter S. Gordon of Tacoma as chairman.

Ward had been under consideration for another new position, that of director of public utilities at Tacoma. The state position pays $15,000, as compared to the $15,120 Ward is getting as City Light superintendent and the $16,000 to be paid the Tacoma director of utilities.

Ward has been a strong supporter of the commission since its creation and has publicly mentioned it as the agency which would enable the state to undertake the "partnership" in power projects which the Eisenhower Administration has proposed.

Career Parallels Raver's . . . Ward has much in common with Dr Paul J. Raver, just appointed superintendent of Seattle City Light (EW, Dec. 21, p 9). He was with Raver at Bonneville Power Administration from 1938 to 1947, first as engineer in charge of transmission line construction and from 1940 as head of BPA's Puget Sound District at Seattle. Both men are civil engineers and hold degrees from Northwestern University.

Before joining Bonneville, Ward had been in private engineering work in Seattle since 1918. In 1951-52 he was president of the American Public Power Association and now is a director of that association, as well as of Northwest Public Power Association.

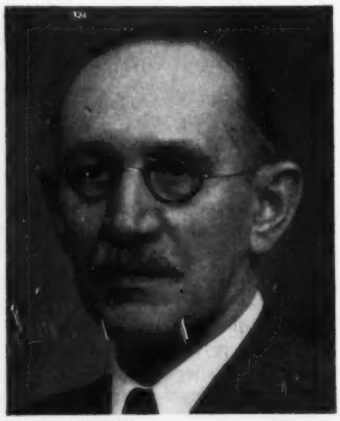
His resignation at Tacoma City Light is to take effect not later than Feb. 28.

Wins Edison Medal

American Institute of Electrical Engineers has named John F. Peters, a consulting engineer of Westinghouse Electric Corp, as recipient of the 1953 Edison Medal. Presentation of the award will be made at the general session of the institute's five-day Winter Meeting, which starts Jan. 18 at the Hotel Statler, New York.

The medal was awarded to Peters "for his contributions to the fundamentals of transformer design, his invention of the Klydonograph, his contributions to military computers and sympathetic understanding in the training of young engineers." The Klydonograph is a device for recording surges on power transmission systems.

Peters started his career with Pittsburgh Steel Co in 1905 as an electrician. A few months later he joined the Armature Division of Westinghouse. By 1917 he was technical assistant to the manager of transformer engineering. In 1926 he was made Westinghouse's first consulting engineer, a title he held until his official retirement in 1950. Peters still serves Westinghouse as a consultant.



JOHN F. PETERS

Ike Answers . . .

. . . Magnuson charges, denies Administration will abdicate its responsibility in power field

Indicating Republican realization of the importance of a power policy in the Pacific Northwest, President Eisenhower, in a letter to Rep Jack Westland of Everett, Wash., denied that the Administration "will abdicate its responsibility in the public power field."

"In close conjunction with private agencies and with the state and local governments, we will continue to examine closely the power needs of the nation and to play an important part in their fulfillment," wrote the President in a statement requested by Republican Westland after the state's Democratic Senator, Warren G. Magnuson, had charged the Republican Administration would step out of the power project construction field when such "going" projects as Chief Joseph Dam and McNary Dam on the Columbia River were completed.

The President gave Westland the right to release contents of the letter for publication. Westland is up for re-election next year in a public power district.

Calls for Proper Balance . . . The President, in effect, declared Magnuson had misquoted him and declared "there is room in the power development field for both private agencies and the government.

"Each has a vital role to play in helping provide for all the people all the power that this great nation needs and will need in the years to come.

"We must try to strike the proper balance between government and private resources. By government I do not mean only the federal government here in Washington (D.C.); I mean, just as importantly, our state and local governments.

"To be truly responsive to the needs of the people, all must work together, each doing what it can do best."

The President reported that Interior Secretary Douglas McKay had been giving him "encouraging" reports "on the progress of his department in achieving a broader-based and more effectively administered power policy has been most encouraging."

"I am confident that we shall look with pride on the achievements of a policy that aims at satisfying our nation's power needs through the widest participation and cooperation of all those groups and agencies which have a legitimate contribution to make."

Magnuson Answers . . . Magnuson, informed of the letter, replied that "the federal government is already out of the power field in this region. The planning and engineering groups have been liquidated, their personnel fired or transferred.

"Our power needs double every ten years, but today not one kilowatt of power, public or private, is projected aside from that planned by the Democratic Administration through dams so far along that they could not be stopped."

Magnuson repeated his charge "that the present Administration is committed to an intense and subtly directed campaign to force up the power rates in the Pacific Northwest and end cheap electric power. It is the easiest way on earth to end a power shortage. It will halt our economic development.

"This is not a partisan issue. Both Republicans and Democrats in this region are interested in cheap power. We do not care who develops it or who sells it, private or public organizations, the federal government, the state or city—but it must be cheap. The margin of profit must go into the payrolls and farms of our region building up free enterprise here—and not into the pockets of bondholders who contribute nothing, and whose sole inspiration in connection with our development is an irresponsible desire to make an unearned dollar."

Offers Challenge . . . Magnuson challenged the Administration to show "just one new construction item" for

Ex-Lamplighter Puts on N.Y. Lights

New lighting system for New York City's Avenue of the Americas was inaugurated this month at Rockefeller Center's Americas Building when Dominick F. Paduano, a former lamplighter who is city commissioner of water supply, gas, and electricity, lit an old whale-oil lamp which activated an electric eye to turn on a four-block section of the system. One of the new lamps is shown at left.

Sponsored by the Avenue of the Americas Association, Inc. the new installation, when completed early next year, will consist of 295 lights running from Greenwich Village to Central Park and on side streets adjacent to Rockefeller Center. The lights, which will provide initial illumination of 1.4-ft candles, will be mounted at a height of 28 ft on steel poles spaced 70 ft apart.

hydroelectric projects in the budget and pledged himself, as a member of the Senate Appropriations Committee, "to work hard to push that item through."

He said the Administration "would not think of denying California the full benefit of its oil resources or Pennsylvania its coal, but they feel it is an unfair advantage for us to have the full use of our great resources—cheap electric power.

"I have been fighting for cheap power for 18 years. President Eisenhower has been involved in this problem less than a year and is ill-advised."

TVA to Conduct Studies in Nuclear Power Field

First sure sign that public-private power competition will be carried over into the nuclear power field came recently with announcement of an agreement between Tennessee Valley Authority and Atomic Energy Commission.

TVA thus becomes the first public power agency to enter into feasibility studies on immediate and long-range possibilities of commercial nuclear power. Several other public agencies, such as City of Los Angeles and City of Seattle have expressed interest in such studies, but have not signed up.

Up until now, privately owned electrical utilities along with other industries and AEC have been studying the economic and technical feasibility of central station power fueled from nuclear sources. Six industry teams are already engaged in this study, and one other firm is studying the feasibility of nuclear power for ship propulsion.

Under the agreement announced recently, TVA will assign several of its top engineers to conduct necessary research and development studies along the lines of the industry team studies. Funds for the study will come from TVA's power revenues.

Reports and recommendations will be submitted to AEC. As is true with the industry teams, title to inventions and discoveries and disposition of reports made in the course of the study will be determined by AEC.

TVA, one of the nation's largest single power producers and marketers, supplies a major portion of power for AEC facilities at Oak Ridge, Tenn., and Paducah, Ky.

Run-of-River Plants on Snake . . .

. . . instead of high Hells Canyon project recommended by Washington State witness at FPC hearing

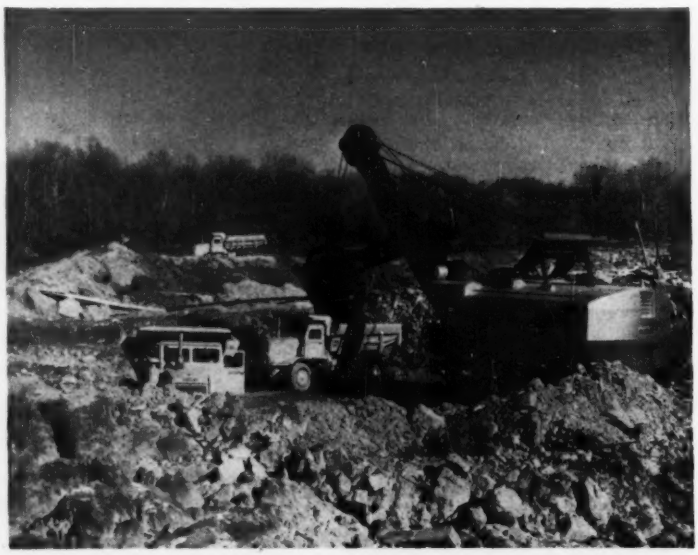
High Hells Canyon project and several other proposed lake storage reservoirs in the Columbia River Basin should be trimmed down to run-of-river power plants, a Washington State witness testified at recent Federal Power Commission hearings.

Holland H. Houston, technical advisor to Gov Arthur B. Langlie, said the cyclical storage features of the large reservoir projects are uneconomical as a source of power in adverse water years.

Recommends Steam Additions . . . He recommended instead sizable installation of steam generating capacity to supplement hydro power in years of poor stream flow. Exhibits offered by Houston indicated that steam-generated power for this purpose could be supplied at one-fifth the cost of power supplied from the cyclical storage of the large water projects.

Houston's direct testimony wound up nearly six months of FPC hearings on the Idaho Power Co application to construct a three-dam development on Snake River. Except for short breaks, the hearing has been going on since July 7. It will resume Jan. 4 when Houston is to be cross-examined. Other witnesses to be presented by the FPC staff and National Hells Canyon Association will probably carry the hearings into March of next year.

State of Washington entered the hearing recently as an intervenor because of its interest in Columbia River development. While the bulk of Houston's testimony was in opposition to the high dam advocated by NHCA, it also cast some doubt as to the feasibility of the lower storage dam



Tail Race Excavation at Roanoke Rapids

Tail race excavation is under way at Roanoke Rapids (N. C.) dam site for Virginia Electric & Power Co's 100,000-kw hydro plant. Giant 7-yd capacity electric-driven power shovel is shown in middle of river bed. Tail race project will necessitate deepening Roanoke River from new dam to present Vepco power station located down the river at the highway bridge.

Total estimated cost of project is $30 million. Completion is scheduled for late 1956.

which Idaho Power plans to build in its three-dam scheme.

General Agreement with Idaho Power . . . On the whole, the Washington State witness indicated general agreement with the Idaho Power plan noting that the smaller storage dam would cost little more than a straight run-of-the-river plant.

Mrs Evelyn Cooper, attorney for NHCA, spent more than a day questioning Houston on his qualifications. Upon conclusion of his direct presentation, she moved to strike his entire testimony from the record on grounds of incompetency, calling it "unsupported opinions and hearsay evidence . . ."

At one point, she described Houston as a sort of "free-wheeling personal representative of the governor of the State of Washington."

Examiner William J. Costello took the motion under advisement and will announce his decision when the hearing reconvenes in early January.

Houston's Reasoning . . . In urging steam-generated power to replace the power production from cyclical storage, Houston reasoned this way:

There would be 2.8 million more acre ft of storage in the proposed high federal dam at Hells Canyon than in the low Idaho Power dam. Difference in cost is $252 million. This cyclical storage would furnish 4,850,000 kwhr for use once in 20 years. Because of the fixed charges, energy cost would be 5.75¢ per kwhr.

Steam-generated electricity could be produced on the same basis at a cost of 1.08¢ per kwhr—or about one-fifth that from the cyclical storage. This assumes the steam-generating capacity would be used at an average annual load factor of 17.5%, that it could be installed at $150 per kw and the cost of oil would be about $2.20 per barrel. Efficiency of such a plant would have to be 13,000 to 14,000 But per kwhr.

Government financing is assumed in both cases.

Stream flow records for the Snake River indicate an adverse water year once every 20 years, and it is on this basis that the Houston exhibits were prepared.

Houston made it clear that he did not oppose all storage projects in the Columbia Basin, but only to the relatively high-cost storage afforded by Hells Canyon and several others in present Army Corps of Engineers' plants. Besides Hells Canyon, he pointed specifically to Mountain Sheep and Nez Perce.

Instead, he said storage should be made at smaller upstream sites in the U. S. and Canada.

Main Points in Testimony . . . Main points made in the Houston testimony:

- Additional energy should be supplied to the Pacific Northwest power system in adverse water years by steam-electric projects.
- Small annual storage reservoirs located on the tributaries of the Columbia can control the snow-melt floods without inundating large areas of agricultural lands and will result in more flexible system operation.
- High head storage project at Hells Canyon becomes entirely cyclical storage not later than 1973, and as such should be eliminated as an element of the program.
- No storage is justified on Snake River below the Wieser River.
- Storage on Clearwater, Salmon tributaries would provide regulation for run-of-river projects downstream.
- There would be little loss in converting the water power into electricity no matter which project is used.
- Additional expenditures of $252 million for development of storage at the Hells Canyon site is not justified.

Changes in Capacity Reported to FPC

PLANT ADDITIONS DURING OCTOBER

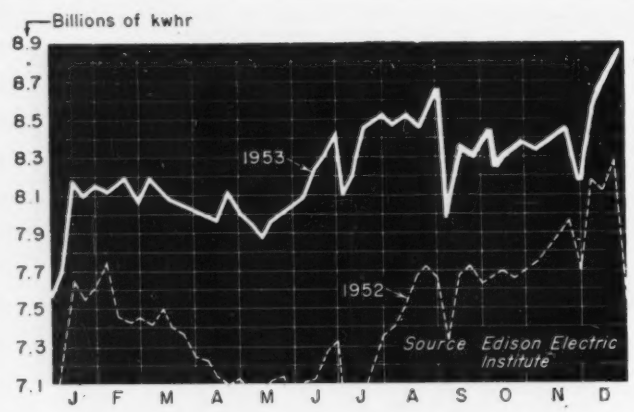
State	Utility	Plant	Fuel	Capacity (Kw)
Conn.	United Illuminating	English	S	30,000
N. Y.	Niagara Mohawk Power	Albany	S	80,000
N. Y.	Rochester Gas & Electric	Rochester 7	S	50,000
Pa.	Grove City Municipal Light & Water Department	Grove City	IC	1,500
Pa.	Scranton Electric	Stanton	S	40,000
Ohio	Hiram Municipal Light Department	Hiram	IC	200
Ohio	Municipal Light & Water Works	Plain City	IC	675
Ohio	Cincinnati Gas & Electric	W. C. Beckjord	S	100,000
Ind.	Decatur Light & Power Department	Decatur	IC	3,810
Ill.	Springfield Water Light & Power Department	Lake Side	S	20,000
Mich.	Edison Sault Electric	Mackinac Island	IC	840
Wis.	Madison Gas & Electric	Madison	S	30,000
Wis.	Wisconsin Electric Power	Oak Grove	S	120,000
Minn.	Minnesota Power & Light	Aurora	S	44,000
Minn.	Northern States Power	Minnesota Valley	S	40,000
Iowa	Mapleton Municipal Electric Department	Mapleton	IC	560
Iowa	Iowa Electric Light & Power	Boone	S	15,000
Va.	Corps of Engineers	J. H. Kerr	H	32,000
Va.	Corps of Engineers	Philpott	H	6,700
S. C.	Corps of Engineers	Clark Hill	H	40,000
S. C.	South Carolina Public Service Authority	Pinopolis	S	40,000
Fla.	Gulf Power	River Junction	S	40,000
Ky.	Tennessee Valley Authority	Shawnee	S	135,000
Tenn.	Tennessee Valley Authority	Cherokee Dam	H	30,000
Okla.	Western Farmers Electric Co-op	Anadarko	S	30,000
Tex.	Vernon Municipal Light	Vernon	1C	1,360
Tex.	Electra Light & Power Department	Electra	IC	1,960
Tex.	Brownsville Water & Light Department	Brownsville	S	15,000
Wyo.	Lower Valley Power & Light	Strawberry	H	500
N. M.	Farmington Electric Department	Farmington	IC	800
Calif.	Pacific Gas & Electric	Contra Costa	S	112,500

PLANT RETIREMENTS DURING OCTOBER

N. Y.	Rockville Center Electric Department	Rockville Center	IC	1,700
Ohio	Hiram Municipal Light Department	Hiram	IC	200
Ill.	Greenup Light & Power Department	Greenup	S	414
Wis.	Dairyland Power Co-op	Chippewa Falls	IC	700
Wis.	Madison Gas & Electric	Madison	S	15,000
Kan.	St. John Municipal Light Department	St. John	IC	136
Va.	Shenandoah Valley Electric Co-op	Dayton	IC	5,090
S. C.	Belton Light & Power	Belton	IC	875
Ariz.	Salt River Project Agricultural Improvement & Power District	Cross Cut	H	2,100
Ariz.	Arizona Public Service	Yuma	IC	2,500
Wash	Public Utility District 1	A & M Lumber Co	S	1,000
Wash.	Ellensburg Electric Light & Power Plant	Ellensburg	H	1,900

H—Hydro, IC—Internal Combustion, S—Steam
United States Capacity as of November 1—Hydro, 21,603,705 kw; Internal Combustion 2,136,766 kw; Steam, 64,886,687 kw; Total, 88,627,158 kw.

STATISTICS



Output Week Ended Dec. 19—8,896,250,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Dec. 19	+7.4	+4.6	+3.4	+1.2	+8.0	+18.0	+4.7	+7.6	+27.8	+2.1
Dec. 12	+6.4	+0.4	+1.1	+0.0	+6.7	+16.5	+5.1	+10.1	+27.2	+4.9
Dec. 5	+5.1	+0.9	+0.9	−1.1	+6.5	+15.2	+3.8	+7.4	+21.0	+2.2

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	Sept.	77.2	77.1	69.6
Capacity (Million Kw)	Oct.	88.62	87.59	79.70
Production (Billion Kwhr)	Oct.	37.61	37.04	34.87
Hydro	Oct.	7.14	7.59	7.02
Fuel	Oct.	30.48	29.45	27.85
Fuel Consumption				
Coal (Million Tons)	Oct.	10.22	9.70	9.94
Oil (Million Barrels)	Oct.	6.78	6.16	7.16
Gas (Billion Cu Ft)	Oct.	96.85	105.30	82.62
Sales (Billion Kwhr)	Sept.	32.64	32.82	30.11
Residential	Sept.	8.55	8.48	7.66
Commercial	Sept.	5.90	5.98	5.37
Industrial	Sept.	15.67	15.83	14.75
Other	Sept.	2.51	2.52	2.33
Net Income Class A & B Companies ($ Million)	Oct.	76.23	81.17	65.94
Estimated Dec. '53 Peak (Million Kw)	Sept.	85.6	86.2	88.0
Kwhr per Residential Customer (12 Month Average)	Sept.	2,303	2,289	2,131
Revenue per Kwhr Residential Service (12 Month Average)	Sept.	2.76¢	2.76¢	2.77¢
Canadian Production (Billion Kwhr)	Sept.	5.09	5.09	4.99

Business Statistics

FRB Industrial Production Index††	Oct.	236	236	233
Gross National Product Annual Rate ($ Billion)	3rd Qtr.	369.0	372.4	345.3
EW 5 Industry Production Index	Oct.	127.6	128.3	127.4
ENR Construction Cost Index††	Nov	128.1	128.0	123.4
BLS Consumer's Price Index	Oct.	115.4	115.2	114.2
NEMA Insulation Materials Sales Index†	Oct.	154	153	161
NEMA Electric Appliance Sales Index†	Oct.	91	101	113
NEMA Household Refrig. Sales Index†	Oct.	46	62	62
Metal Prices				
Copper, Conn. V., lb		$.29-.30	.29-.30	.24¼
Lead, N. Y. lb		.13½	.13½	.14
Zinc, prime Western E. St. Louis, lb		.10	.10	.12½
Tin, Straits, qual. N. Y., lb		.85½	.82	1.21½
Aluminum, ingot, base price		.21½	.21½	.20
Nickel, base price		60	.60	.56½
Steel, billets, Pitts., ton		62.00	62.00	59.00
Steel, scrap, No. 1 heavy, Pitts., ton		36.00	36.00	46.00

*Preliminary **Revised †1947-49=100 ††1949=100 †††Unadjusted

1953—More Households: More School Children

The changing make-up of the population as reported periodically in Census Bureau Studies is of considerable interest in industry forecasting. In this connection two recent studies of the Bureau, on households and school enrollment, seem particularly relevant.

Households in the United States have been increasing at an average annual rate of 950,000 for the last three years. As of April, the figure was 46,828,000, a 21% gain over last year. Before that the annual increase had been much greater—one and a half million for the three years from 1947 to 1950. During the war years of the early forties however, and up to 1947, the increase had been much smaller, about 600,000 annually. The sharp compensatory rise that then followed apparently now is levelling off.

"Households" refer to all persons occupying a house, apartment, or other group of rooms that constitute a dwelling unit. It does not include institutions, hotels, large rooming houses, or military barracks. The Census Bureau's estimates, based on a sample of 25,000, show that the average number of persons per household was 3.28. In relation to the total of 37,100,000 married couples last April, only 4.2% of these, or 1,540,000, were sharing the living quarters of others, or in other ways constituting a "quasi-household."

With increases in households, and increases in marriages in the last few years (1952 saw a record number of marriages, despite a decline since 1950 in the number of young people at the marriage age), it is not surprising that a new record of school enrollments was set at the beginning of the 1953-54 school year. In October of this year there were 33 million persons enrolled in school or college, an increase of 1.7 million over October 1952. Significantly, two-thirds of the increase was in the 5 to 13 year-old category. The breakdown of the total enrollment reveals that about 23 million were in elementary school, about 7½ million in high school and about 2½ million in college or professional school. Evidently such trends will be important in industry planning for next year as well as for predicting for the next ten or twenty years.

WASHINGTON COMMENT

JESSE MOCK

Federal Power Policy Changes Are Significant

The year 1953 has been a vastly significant one from the standpoint of shifts in federal power policy. Not since 1933 has there been such a clearly-defined break with the past in administration thinking on electric power matters. That year witnessed creation of the Tennessee Valley Authority, which signaled an era of federal and public power expansion.

Many of the attitudes formed and policies established during those 20 years will probably be with us for decades to come. Certainly some of the vast federal power projects built during that era will stand as a reminder for a century or more.

Less Daring But as Durable . . . Power policies announced during the first year of the Eisenhower administration have been less daring and less dramatic but may prove to be just as durable. Like the policies of preceding administrations, these are erected on a foundation of public opinion rather than on a party line.

Underneath the detailed statements and tedious speeches the chief aim seems to be to de-emphasize the federal role in power development and marketing. The administration does not intend to use the authority and prestige of government as vehicles for expanding federal electric power operations. This is something short of getting the government out of the power business entirely, but it still represents a deep philosophical departure from New and Fair Deal policies.

A Trend That Started in 1947 . . . Actually government power policy has been moving in this direction since 1947, often against the wishes of the White House. Congress through its appropriation authority has limited the role of the federal government in the power business and effectively curbed the empire-building tendencies of several federal officials who had dreams of putting federal projects in all sections of the country.

Large organizations in several regions of the country stalled creation of other federal regional authorities along the TVA lines. Even some of the most dependable public power advocates were coming around to the view that the appropriations process just isn't geared to providing funds for expanding generation requirements. This was especially true of those living in areas where federal projects have played an important part.

Not a Deciding Election Factor . . . Presidential campaigns last year reflected this gradual shift away from federal dominance in the nation's power development. Candidate Eisenhower made an issue of the question in the Northwest, terming it the "whole hog" philosophy of resource development. Democratic candidate Adali Stevenson also sounded a plea for cooperation rather than federal domination in the field.

This trend was not recognized by former President Truman and some of his associates who kept plugging away for policies which Congress had been rejecting for years.

Few contend that the power issue was a deciding factor in the national election last year or that it will have any widespread impact on the Congressional elections next year. Federal power is still unknown to most of the voters. But the underlying philosophy on which the new policy is built was an important factor, and it will likely be next year.

Opposition thus far has come mainly on the procedures evolved for carrying out the Republican policy. Rural cooperatives, for instance, are reluctant to give up the many benefits afforded them by previous policies. The all-out federal power advocates are seizing on this specific situation in an attempt to discredit not only the policies but the underlying philosophy. How well they succeed depends on public opinion.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Sound propagation at less than 10,000 fps through concrete is considered evidence of poor concrete; 13,000 fps is rated good concrete.

Abrasion of power plant motor windings by stoker dust has been substantially reduced by applying a neoprene coating over the insulation.

Moisture content of soil is critical at 4% for heat dissipation from buried cables; below 4% the soil dries out relatively rapidly. Maybe this explains some of the "thermal runaway" failures of cables.

Ground rods 22 feet long and ½ in. diameter will have practically half the resistance of a 10-foot ¾-in. rod.

REA cooperatives' circuits are about 90% the 7,200/12,470-volt type and over half are protected by single phase automatic oil circuit reclosers.

Deeper cracking and further refining of crude oils to meet increasing demand for distillate products is likely to result in higher content of inorganic materials in the residues. The problem of deposits from combustion of these fuels may become more acute.

Under-frequency relay can cut a house generator and the plant auxiliary system loose from the rest of the system to assure full voltage and frequency supplied to the auxiliaries.

Magnesium anodes are likely to be consumed at an uneconomical rate if used to protect a cable system the sheaths of which are bonded to the municipal water system. The bonding makes too much metal to drain.

Aeolian vibration of ACSR transmission conductors has been effectively overcome by torsional dampers comprising dumbbell weights eccentrically mounted with rubber washers to dissipate the vibration energy.

Remote operation of a power plant can hardly be called complete unless the boiler can be lighted off, the turbine brought from standstill to full load and then both shut down without plant operators leaving the control.

FINANCIAL

Tax Law Changes

Industry's suggestions are being studied by House Ways and Means Commitee staff

Electric companies during the coming session of Congress will press for two modifications in existing tax laws.

Staff of the tax-writing House Ways and Means Committee is now working with Treasury Department officials on these and hundreds of other suggestions put before the committee during hearings this summer. Their job is to digest the hearings and come up with recommendations for changes in federal tax statutes. This report will probably go to the Ways and Means Committee soon after Congress convenes.

No More Public Hearings Expected . . . While no further public hearings are now anticipated, it will probably take the House committee months to study recommendations and come up with a bill incorporating some of the proposals for tax revisions. The bill would then go to the House for approval before being sent to the Senate.

Suggested changes of direct interest to electric companies would:

- Exempt from individual income taxes a small, fixed ($200-$500) amount of corporation dividends, on which corporation income taxes had already been paid. Aim would be to encourage small investors to finance the capital expenditures of corporations.
- Levy a tax of approximately 13% on revenues derived from sale of power by tax-exempt bodies such as municipalities, state and federal agencies. Objective would be to erase at least a part of the present inequality between taxpaying and non-taxpaying electric utilities.

Both these proposals were made by the special tax policy committee of the Edison Electric Institute and presented to Congress by Charles E. Oakes, chairman of the EEI group. Oakes is president of the Pennsylvania Power & Light Co.

P. L. Smith, president of the National Association of Electric Companies, recently said these proposals are receiving serious consideration from the Administration. He declined

(*Continued on page* 147)

Today in Utility Finance

YIELDS (%)

Quality	Bonds 1st	Bonds 2nd	Bonds 3rd	Preferred Stocks 1st	Preferred Stocks 2nd	Preferred Stocks 3rd	Common Stocks 1st	Common Stocks 2nd	Common Stocks 3rd
DATE 1953									
Dec. 17	**3.08**	**3.13**	**3.36**	**4.17**	**4.35**	**4.63**	**5.08**	**5.49**	**5.55**
Dec. 10	3.09	3.14	3.34	4.19	4.39	4.64	5.10	5.53	5.64
END OF QTR.									
3rd 1953	3.30	3.33	3.54	4.35	4.52	4.83	5.36	5.97	6.01
2nd 1953	3.34	3.46	3.64	4.47	4.70	4.88	5.52	5.93	6.10
1st 1953	3.15	3.23	3.39	4.16	4.41	4.66	4.95	5.24	5.50
4th 1952	2.99	3.03	3.15	4.06	4.22	4.59	4.98	5.33	5.62

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months	Ended	Net Income 1953	Net Income 1952	Earnings Per Common Share 1953	Earnings Per Common Share 1952
Arizona Public Service	12	Oct.	$3,740,000	$3,302,000	$....	$....
El Paso Electric	12	Oct.	1,671,987	1,556,352	2.10	1.95
Ohio Edison, consolidated	12	Nov.	19,026,965	15,820,326	3.10(a)	2.91(a)
Pennsylvania Power	12	Nov.	2,335,630	2,120,682	....	....
West Penn Electric consolidated (b)	12	Oct.	14,472,608	13,081,473	3.42(b)	3.30(b)

Notes—(a) Based on 5,278,306 shares in 1953 and 4,798,460 shares in 1952; and (b) Income account for both periods have been adjusted to take care of the nullification of a Pennsylvania Public Utilities Commission order of Feb. 16, 1953 by the Superior Court of Pennsylvania on Nov. 11, 1953. This PUC order provided for a reduction in the amount of the increase in electric rates of West Penn Power Co. which the commission had permitted to become effective late in 1951. The per share earnings are based on 4,224,000 shares in 1953 and on 3,960,000 shares in 1952.

FINANCING

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF DECEMBER 17-23			
Bonds			
Nashville, Tenn—electric revenues 2, 2½, and 2¾% due 1957-84	$3,000	various	1.5-2.7%
SCHEDULE FOR JANUARY—FEBRUARY—MARCH—APRIL			
Bonds			**Bid Date**
Consolidated Edison Co. of New York—1st mtg due 1984	$35,000	.....	Jan. 6
Appalachian Electric Power—1st mtg due 1984	20,000	.....	Jan. 11
Public Service Co of Indiana—1st mtg due 1984	25,000	.....	Jan. 12
Salt River Project, Ariz., Agriculture & Improvement & Power District—electric revenues	5,000	.....	Jan. 12
Ohio Edison—1st mtg due 1984	30,000	.....	Jan. 19
Alabama Power—1st mtg due 1984	17,000	.....	Mar. 16
Georgia Power—1st mtg due 1984	11,000	.....	April 6
Central Illinois Electric & Gas—1st mtg	4,000	.....	.....
Upper Peninsula Power—1st mtg	1,000	.....	.....
Debentures			
Detroit Edison—debs 3¼% due 1969 (to be offered commonholders on the basis of $100 principal amount of debs for every 25 shares of common held, record Jan. 6 to expire Feb. 1)	$43,358	$100.00	3.25%
Preferred Stock			
Central Illinois Electric & Gas—15,000 sh $100 par	$1,500	.....	..... (a)
Kansas City Power & Light—70,000 shs $100 par	7,000	.....	.....
Iowa-Illinois Gas & Electric—40,000 sh $100 par	4,000	.....	.....
Common Stock			
Consumers Power—679,436 sh (to be offered commonholders on a 1-for-10 basis, record Jan. 7 to expire Jan. 22; employees will be given right to unsubscribed shares)	$	.....	.....
Ohio Edison—527,830 sh (to be offered commonholders on 1-for-10 basis, record Jan. 14 to expire Jan. 29 with an oversubscription privilege)	.....	.....	.....
Upper Peninsula Power	500	.....	.....
Kansas City Power & Light—225,460 sh	.....	.....	.....
POSTPONED, UNSCHEDULED, AND/OR UNDER CONSIDERATION			
Bonds			
Southwestern Public Service—1st mtg	$12,000(e)	.....	.....
Houston Lighting & Power—1st mtg	25,000	.....	.....
Public Service Co of Colorado—1st mtg	15,000	.....	.....
Brazos River Authority, Tex.—electric revenues	66,000	.....	.....
Essex County Electric—1st mtg	4,000	.....	.....
Utah Power & Light—1st mtg	16,000(e)	.....	.....
Preferred Stock			
Southwestern Public Service	$3,000(e)	.....	.....
Common Stock			
Iowa-Illinois Electric & Gas	$6,000(f)	.....	.....
Southwestern Public Service—about 272,000 sh (to be offered on 1-for-14 basis)	.....	.....	.....
Utah Power & Light—about 225,000 sh	.....	.....	.....

Notes—(a) To be offered by a group headed by Stone & Webster Securities Corp during the week of Jan 4; (e) Estimated; and (f) To sell enough common stock to yield $6 million.

Looking over 1953's shoulder

and ahead for...

1954

1953

has been a year of great gains for the industry in management and engineering, in sales and operations. Here from its pages Electrical World has gathered for the industry its . . .

Yearend Round-Up and Forecast

In 1953 the United States economy reached new peaks, and the electric utilities set new records. The gross national product, the sum total of the goods and services purchased, was $368 billion, $20 billion above 1952.

The industrial production index, as recently revised, averaged 134 compared with 124 in 1952. Consumer disposable income was $248 billion, a $13 billion increase, and 1,100,000 home units were completed.

Reflecting these business conditions, our preliminary forecasts for Class I electric utilities for 1953 indicate an output for load of 441 billion kwhr, 43 billion over 1952. Peak loads are up 6 to 8 million kw depending upon the weather the latter part of December, and almost 9.5 million kw of capacity will be added. In total the expenditures for all agencies, public and private, will be about $4 billion for capital additions. Power companies alone will spend $2.85 billion.

Overall growth of sales to residential customers will be 12% over 1952. Sales to small light and power customers will climb about 10%. Large light and power sales will show a record growth of around 20 billion kwhr even though they were slipping as the yearend approached.

Looking Ahead . . . We are assuming that business as a whole will be down in 1954. In evaluating the electrical business for 1954 we have assumed overall drops of 3% in gross national product, 8% in industrial production, 6% in industrial capital expenditures, 15% in housing, and 1% in consumer disposable income. But in spite of these we believe production of electrical energy will continue upward.

Sales of most major appliances are expected to be lower in 1954—down 5% or 10%. But this will still be very good business compared with past averages. Some of the newer appliances, such as clothes dryers, air conditioning units, and home freezers, will continue to produce new sales records.

Power Usage Will Grow . . . On this basis, growth in use per customer will be less in 1954 but only to the extent of the small decrease in disposable income. This growth may amount to no less than 165 kwhr per customer raising national average use to over 2,500 kwhr per year. It is expected that small light and power use will grow almost as much as in 1953.

In spite of the decrease in industrial production expected in 1954, large light and power sales may again increase because of a predicted growth of some 11 billion kwhr in sales to Atomic Energy Commission installations.

Reduced industrial power demands and increased capacity additions will widen the margin between load and capacity to safe limits except perhaps in the Pacific Northwest.

The cost of new facilities and greater reserves will require higher earnings. Some of this can be made up from operating and investment economies and growth in use, but rate adjustments will still be needed in many cases.

Turn page for review and forecast articles.

Just Ahead in Generation

Turbo-generator unit sizes are moving toward 300 Mw, and even 500 Mw has been mentioned as practicable.

Boilers may have to be paired or at least dual-furnaced to keep pace with the turbo-generators.

Cyclone combustion, gas recirculation, controlled circulation, and once-through designs are indicated.

Steam of 1,100 F at Kearney and the 1,150 F projected for Philo are setting the tempo for temperature in the art.

Reheat is moving toward duplication and even tripling now that single reheat has become a fixture.

Outdoor and semi-outdoor plant designs will spread in the middle-belt of climate.

Centralization of controls may slow down in the face of feeling that operators have been reduced in number to a point of minimum.

Controls are being refined all along the line to put apparatus protection on the automatic rather than human level.

New Steam Frontiers Achieved in '53

Without doubt the most significant event of 1953 in power generation was the big jump from the former top steam pressure of 2,500 psi clear across the critical realm to 4,500 psi for the Philo Plant of American Gas & Electric Co.[1] Meanwhile commitment has been made for 260-Mw units for Detroit Edison's River Rouge plant.[2] The boilers to go with the top pressure job will be once-through, drumless, and may have revolutionary configuration. Those for the very large units seem to be tending toward dual-furnace with division of the superheater sections.[3]

Hand-in-hand with such departures in design is a disposition to be more critical than ever about the heat cycle and every item that participates in heat transfer, absorption and release.[4] Recirculation of combustion gases to help control steam temperatures is taking hold and so is pressurization of furnaces.[5] Recent stations show that designs have been geared to thwart the rising costs of fuel, materials, and labor to the extent of holding generation at the preceding level of 3 to 4 mills per kwhr.[6] Parallel with advances on the steam side has been the inner cooling of generator windings, liquids as well as air being considered.[7]

Progress of the steam plant art has not been free of worries and troubles. Thus, scant water supply for condensing purposes has given a spurt to cooling towers for plants not in areas where water is favorable.[8]

At the other end of the plant, the public aroused about air pollution is fostering intensified adoption of ash collection equipment such as mechanical, electrical precipitators, Cyclone furnaces, stack nozzles, etc.[9] Flyash incorporation in cement mixes actually is found to enhance the strength of concrete and bids fair to establish a credit against the plant outlay to prevent its emission.[10] The "troubles" sector also embraced a lubricating oil fire initiated by vibration of a turbine[11] and clogging of intake screens by millions of shad.[12]

Quick start of turbines and boilers has been spreading as a result of several expositions of Consolidated Edison's philosophy and experience with the technique.[13] Station controls have been stepped up to keep pace with performance of lines and of despatching aimed at optimum loading of stations and units.[14] Electronic circuits have multiplied to the point where one station has 1,500 tubes.[15]

Nuclear energy prospects have advanced to the point where some utilities and industrials indicate they are nearly ready to hazard their own funds for a power-generating nuclear reactor once the legal way is cleared.[16] Comparative merits of various reactor designs have been disclosed through utility-team studies[17] which show that economic feasibility of nuclear generation is nearer to realization.[18]

Small streams have become more attractive economically for hydro cultivation as a result of advances in design of dams, electrical controls, and the costs, both construction and operating.[19] In fact, automatic and supervisory control for hydro plants was found to cost less than just the cost of housing accommodations alone for manual operators.[20] Only maintenance workers serve in the completely automatic 33,750-kw Holcombe hydro plant of Northern States Power.[21]

Pumpback got an additional credit by the reversible pump-turbine installation by TVA at Hiwassee.[22] Rio de Janeiro has a wholly underground hydro plant that is associated with pumped-up water.[23] Cement lining of corroding steel pipe by means of a manned buggy extends penstock life for a western hydro.[24] Hydro Electric Power Commission of Ontario established that concrete for dams and structures can be rated superior if its supersonic transmission velocity is 12,000 fps or more; poor quality or deterioration is indicated by velocities below 10,000 fps.[25]

References to 1953 Issues of Electrical World

1. 6/29 p 63, p 72-76
2. 3/18 p 96-256
3. 3/9 p 131
4. 4/20 p 131, 12/28, p ...
5. 1/12 p 68
6. 7/13 p 121
7. 4/20 p 137
8. 2/23 p 103
9. 1/19 p 24, 7/20 p 24, 7/27 p 92, 8/3 p 32
10. 1/12 p 62
11. 1/26 p 124
12. 3/9 p 89
13. 4/27 p 24
14. 2/9 p 84
15. 10/19 p 111
16. 11/9 p 7
17. 11/9 p 24
18. 6/1 p 53, 6/15 p 53, 114-18, 6/29 p 87-8[illegible]
19. 9/7 p 80
20. 2/9 p 87
21. 1/5 p 28
22. 5/11 p [illegible]
23. 3/23 p 130
24. 2/9 p 106
25. 5/4 p 79

EHV Dominates 1953 Transmission

Both here and abroad, 1953 has seen marked activity in transmission at voltages 230 kv and above as major power systems of the world reacted to the need to move huge blocks of power farther at less cost.

In the United States and Canada transmission circuits were being built or completed by British Columbia Electric,[1] Bonneville,[2] and American Gas & Electric for operation at 330/345 kv. To handle circuit interruption at these voltage's the world's highest capacity circuit breakers, 15 million kva, were completed and shipped[3] in the same 12 months that saw breakers of even higher rating (25 million kva) ordered[4] for the Atomic Energy Commission and the Ohio Valley Electric Co.

Overseas, Sweden rounded out a year's operation of its 380-kv, 800,000-kva line,[5] first at this voltage and highest voltage line now operating anywhere. Meanwhile, the British Electricity Authority inaugurated the first 40-mile link in its 275-kv supergrid[6] which by 1960 will stretch 1,200 miles.

But the innovations were not confined to EHV or to overhead transmission. High-voltage cable developments moved at a brisk clip. Bonneville prepared to lay a 230-kv submarine cable[7] 700 ft down on the floor of Puget Sound, an operation involving cable supporting tensions of 30 tons and near record lengths of unspliced cable. Carrying a 138-kv pipe cable across the Narrows of New York Harbor, Consolidated Edison pulled a record unspliced 6,800 ft of cable[8] into pipe partly filled with oil.

In Sweden this year some 60 miles of 100-kv, direct current, single-conductor cable was laid under the Baltic Sea to the island of Gotland.[9] The cable, which is to transmit 20,000 kw, is the first circuit to use dc for long distance transmission of energy. In Britain tests were conducted on 132-kv, gas-filled cable[10] that the British Electricity Authority hopes to lay under the English Channel between Dover and Calais, some 26 miles, to link its 132-kv system with the French 90 and 225-kv systems.

In the U. S. as right-of-way costs for overhead lines near cities continued to increase, the trend to high voltage underground cable accelerated and cable loadings increased. The effect was to accent the need for data on heat dissipation particularly from pipe cable to soil.[11] Year's end found widening experience with pipe cable as generator leads, station ties, and substation feeders in voltages up to 138 kv.

Electrical World's transmission survey[12] pointed up the variety of circuit characteristics and structural variations in use in today's transmission systems. Popularity of wood in the lower voltages is spreading into the EHV range[13] with Alabama Power choosing a structure with wood poles and steel arms[14] instead of steel after a study of 230 287 330 kv.

Wood likewise found favor in two recent 230-kv, single-circuit H-frame lines one associated with EE Inc's Joppa Plant, the other on the Public Service of Indiana system.[15] The latter drew added strength from braced-spar H-frame construction that used metal gain plates to join the round members without cutting gains. Destructive tests proved the advantage in this instance, but during the year in New England damage from the Worcester tornado to 115-kv steel towers provided the key to wind velocities and pressures attained.[16] Velocities of 350 mph and pressures of 400 psf on flat surfaces were deduced.

Attention focused in EHV studies on the use of multiple conductors to keep down losses is reflected in new interest in double conductors[17] on lower voltage lines.

At all transmission voltages, the merits of the helicopter and light plane for patrolling[18] and rapid transport of men and supplies, are being recognized. An occasional utility is using planes and helicopters for line stringing[19] and to survey line routes[20] rapidly and at as little as half the cost of ground survey. But ground survey is still required for detailed examinations such as detecting overheated conductor splices. In Ontario this is being done[21] by using binoculars to look for shimmering hot air eddies around overheated joints.

What's Ahead In Transmission

Actual operation of 330/345 kv lines at their design voltage will take place for the first time in 1954

First 440-kv line in U. S. will be a reality within five years, probably on the Pacific Coast

Apparatus designers will focus increasing attention on switching surges at all transmission voltage levels as a result of refinement of insulation.

Mileage of lines at 230-kv and above will double by 1960

Use of wood for 230-kv lines will gain increasing acceptance

Higher circuit loading will continue to receive emphasis at all transmission voltages on both overhead and cable circuits

References to 1953 Issues of Electrical World

1. 1/26 p 123
2. 9/21 p 118, 8/24 p 149
3. 8/3 p 47
4. 2/16 p 15
5. 9/14 p 14
6. 8/31 p 32
7. 2/23 p 97
8. 10/5 p 98
9. 11/23 p 94
10. 7/20 p 18
11. 2/9 p 90
12. 8/24 p 121
13. 9/9 p 88
14. 8/24 p 113
15. 4/6 p 76
16. 8/17 p 22
17. 7/27 p 101
18. 7/27 p 117
19. 3/9 p 118
20. 6/29 p 88
21. 4/20 p 140

Looking Ahead in Distribution

Service interruptions in disaster areas will be shorter and more confined.

Cable, both aerial and underground, will be used more extensively.

Reliability of residential service will be improved.

Fuller advantage will be taken of inherent load capability in substations, lines and cables.

System voltage levels will be boosted wherever economy is furthered. Watch 460 v service to large buildings and 11 to 13 kv for primary circuits.

Transformer-secondary combinations will be heavier, and more 3-phase installed in residential areas.

Aluminum conductors will gain wider acceptance.

TVI and voltage flicker both will be cut by use of recently developed test equipment.

Ingenuity will promote economy and efficiency.

Distribution Seeks Reliability

Snow and sleet, hurricanes and tornadoes take the lead in any review of distribution for 1953. Most important was the storm of Jan. 9 which iced down poles and wire from eastern Pennsylvania to southwestern Connecticut.[1] Upwards of 250,000 customers had service interruptions, many for several days.

Tornadoes took their toll at Waco and San Angelo, Tex., May 11,[2] toppled 450 poles at Flint, Mich., and Cleveland, June 8, and struck Worcester, Mass., the following day.[3] And hurricane Barbara lashed the Carolina coast Aug. 13.[4]

Reaction to these catastrophes was prompt and vigorous. Predetermined emergency procedures were reviewed for adequacy by ultilities across the country. And Philadelphia Electric reported a reserve emergency headquarters, complete with wire and radio communications, tested out frequency by staged "disasters."[5]

But Connecticut, hardest hit by the January sleet, conducted a PUC investigation. Connecticut Light & Power proposed studies of construction, inspection, and sleet melting.[6] PUC order demanded use of aerial and underground cable wherever sound engineering and economics permit, and better use of weather reports.[7] Redoubled efforts to minimize disasters are assured for 1954.

Distribution Program . . . For several years distribution has had a billion dollar annual capital program. Forecasts show $1.2 billion for 1954 rising to $2.6 billion by 1963.[8] Utility executives warned that only long-range planning gives time for sound engineering and construction.[9]

Residential growth is forecast 11 billion kwhr per year, boosted 6 billion by small light and power.[10] Growing enthusiasm for electric house heating promises continued growth.[11] Banked secondaries were extolled for better residential service.[12] And balanced 3-phase voltage proved essential for packaged air-conditioners.[13] Greater usage in commercial buildings elicited suggestions that service voltage should be 240/416 Y or 277/480 Y.[14]

Primary Improvements Sought . . . Despite pressure to raise primary voltage,[14] several investigators reported that 4 kv is not obsolete[15] but can handle any foreseeable residential load.[16] Users of 4 kv claim better opportunity to avoid service interruptions with tree wire[17] or aerial cable.[18] They suggest cut in tree trimming and wire maintenance may justify investment differential. Low-cost underground costs more than overhead.[17]

Resort to electronics produced three devices for recording voltage fluctuations on lighting service caused by motors and heavy appliances.[19] Special test equipment promoted correction of TV interference.[20]

New Methods Win Substation Savings . . . Taking full advantage of the one-line diagram cuts engineering costs.[21] Laboratory tests proved that copper, tinned copper, and silver-plated copper joints can operate safely for emergency up to 165 C, 200 C and 215 C, but annealling occurs at 170 to 200 C.[22] And substation transformers are used advantageously when fans start at 80 to 85 C hot-spot temperature.[23]

Installation of shunt capacitors continues at a fast pace.[24] But prevention of abnormal voltage when connected to 4-wire distribution requires precautions.[25] And capacitors are the key to devices for 3-phase motors on single-phase service[26] and for single-phase loads on 3-phase service.[27]

Ingenuity Promotes Economies . . . Concerted effort is overcoming connection problems of aluminum distribution[28] and Levittown, Pa., is served with aluminum.[29] Future choice between aluminum and copper can be based on economics.

But the measure of ingenuity is the myriad of tools and devices to speed construction and maintenance.

References to 1953 Issues of Electrical World

1. 1/19 p 8
   2/2 p 16
2. 5/18 p 135
3. 6/22 p 9
4. 8/24 p 107
5. 11/9 p 8
6. 3/16 p 7
7. 8/3 p 19
8. 9/21 p 144
9. 3/2 p 36
   10/19 p 120
10. 9/21 pp 136-141
11. 6/1 p 116
    6/22 p 30
    8/3 p 24
    11/2 pp 71, 80
12. 3/9 p 82
    7/27 p 90
    11/16 p 116
13. 4/20 p 120
14. 11/2 p 77
15. 2/9 p 89
16. 10/19 p 106
17. 5/18 p 131
18. 10/19 p 115
19. 2/23 p 116
    11/30 p 94
20. 4/20 p 116
    10/5 p 111
21. 4/20 p 118
22. 7/27 p 96
23. 8/7 p 85
24. 2/23 p 108
    9/7 p 86
25. 11/23 p 34
26. 5/4 p 74
27. 11/30 p 92
28. 2/23 p 106
    6/1 p 96
    7/27 p 120
    8/3 p 48
    9/21 p 159
    11/16 p 159
29. 10/5 p 84

Industrial Heating Use Increases

More extensive usage and wider application of electric heat in industry highlighted 1953. Power sales engineers intensified their efforts to break down the misconception, too often held by industry, that electricity is a too-expensive fuel. The fallacy of attempting to compare electric heat and fuel heat on a Btu basis received increased emphasis.[1]

Electric space heating for industrial plants received wider application.[2] Simultaneous heating and cooling applications of the heat pump presented new opportunities for power sales engineers.[3] And a low frequency induction heating (60 cycle) demonstration showed that steel billets can be heated in one-tenth time normally required using conventional fuel-fired furnace.[4]

The Industrial Electrification Council was established in response to persistent demands for better coordination at the national level of the educational and promotional programs of utilities and manufacturers of industrial electric heating equipment. During 1953 invitations to membership were extended to manufacturers of this equipment. An educational program got under way. It is designed to acquaint industrial users with the advantages of industrial electric heating and methods of using it in production processes.

This year initial plans of the program were directed toward:

1. Preparation of a brochure of educational and promotional material. This is already available.

2. A National Industrial Electric Heating Conference to be held at Cincinnati, Jan. 18-22, 1954.

3. The preparation of a package course of instruction in the application of electric heat and the design of metal sheath heating jobs for presentation, as a school, for utility power salesmen and industrial groups.[5]

NEMA National Lighting Bureau, launched in 1953, initiated a national campaign to relight industrial and commercial interiors. A director has been appointed, and local lighting bureaus will be set up to help start local relighting promotions.[6]

A new concept in industrial lighting has coordinated the overall job of visual efficiency—a visual screening program, a good lighting installation, and a good paint job, using proper colors.[7] Upward component lighting not only upped industrial lighting levels, but overall efficiency was increased.[8] Fluorescent mercury high bay installations have provided high output and long life, typical of mercury-vapor lamps. In addition, a pleasing warm white light is provided.[9]

Load centers and bus duct installations increased flexibility over conventional distribution methods and equipment.[10] Single-phase indirect arc furnace spreads load on three phases of distribution system.[11] Hidden pull boxes can now be located by use of Geiger Counter and cobalt disc.[12]

Industrial Progress in Coming Years

Sixty-cycle induction furnaces will heat steel billets, up to 1,500 lb, to rolling temperatures five to ten times faster than methods generally used.

Catalytic heat recovery will offer new opportunities for economies in electric oven and drying operations.

Electric furnaces for production of specialty steels will replace open hearths at an accelerated pace.

Ionic demineralization of sea water may provide a possible source of water for drinking and irrigation.

Multiple-cycle motors usage will be expanded in aviation, textile, wood working, and other fields.

Xerography, an electrostatic process, will speed multiple reproduction of printed copy and pictures and may extend into other fields such as a faster cheaper way of making X-ray pictures.

High voltage lighting from 480 Y 277-v distribution systems will be more widely used in commercial as well as industrial buildings.

Color corrected fluorescent mercury lighting will be used extensively to replace mercury vapor and incandescent combination high bay lighting.

Group replacement will receive more emphasis as major lamp producers initiate programs and campaigns.

Series capacitors will find more usage where resistance welders are installed.

Heat pump applications will see wider industrial use in areas of evaporation, distillation, and concentration.

Gas turbines will provide more competition to purchased electric service in certain specific industrial applications.

References to 1953 Issues of Electrical World

1. 6/1 p 62; 6/8 p 14
2. 5/4 p 106; 11/16 p 104
3. 6/15 p 94
4. 11/9 p 8
5. 10/19 p 222
6. 11/2 p 136
7. 2/23 p 100; 6/1 p 63; 11/23 p 9
8. 10/19 p 118
9. 4/6 p 129
10. 10/19 p 174
11. 11/30 p 92
12. 7/13 p 169

Selling Dominated Industry in 1953

Selling—the need for selling, how to sell, and the results to be obtained from selling—dominated the thinking of the electrical industry in 1953. This concern with the problems of selling arose from a realization that the time was near when the industry's productive capacity in both electricity and the appliances and other equipment for using it would be seeking markets.[1] In general, manufacturers of household appliances were confident that markets for their goods would be found and looked ahead to continuing sales increases in the years ahead.[2,3]

The next big development in residential electric service which in time will dwarf all others is comfort heating. There are now between 100,000 and 200,000 homes completely heated by electricity in this country. Most of these use resistance units of one form or another—glass panels, coil resistors, ceiling panels, conductors embedded in ceiling or floor, etc. The heat pump, which holds much promise, represents only about 1 or 2% of the total. Knowledge of the characteristics of the heating load—its demands, load factors, and energy usages—in diverse conditions of climate and living habits is fundamental to future utility financing and engineering. This requirement became more apparent as the number of installations grew.[3]

There came to fruition in 1953 an idea that had been talked about for a long time. This was the formation of a special conference group named to coordinate promotional activities of the industry.[4] Included in the conference group are representatives of the various industry associations. "Electrical Modernization" in homes, factories, and commercial places is the objective towards which the coordination activity is directed.

Right along this line is the announcement of the EEI residential promotion committee of planning for 1954.[5] "Be Modern—Live Electrically" is the theme adopted for utility sales activity.

That the electrical industry has not been doing a good job of selling modern lighting in commercial and industrial establishments is generally agreed. Evidence of this was supplied by a survey made in Indianapolis by the Lighting Section of NEMA a couple of years ago. Further evidence appeared in the report of another survey[6] of the lighting sales activities of utilities. A move towards correction of this situation was the formation this year of the National Lighting Bureau whose function will be to organize and put steam into local bureaus around the country for promotion of modern lighting.

Revenue potential in commercial electric cooking was brought strongly to notice. A survey of utility sales activities in that field[7] showed that many utilities are not giving this source of net revenue the attention it deserves.

Unexpected demand for room air conditioners and large increases in sales of "heavy duty" housewares, such as broilers, roasters, and fryers, posed problems of voltage maintenance for utility distribution engineers[8] as well as for owners of residential and commercial buildings.[9] Not only in the South but also in the North the rapid rise of the air conditioning load caused concern in regard to generating capacity.

Ahead in 1954

It is to be expected that the 1954 sales operations of utilities and of makers, distributors and retailers of appliances and other electrical goods will take impetus and color from Light's Diamond Jubilee.

If, as predicted by a number of economic forecasters, 1954 turns out to be a year of slight decline or at least of "leveling off" of general business, the Jubilee celebration should lift the electrical business above the general level.

With all segments of the industry united to link electricity and modernity together in the various promotional and sales activities of suppliers of electrical goods and services, they can look for more business in 1954 in proportion to their effort to instill the idea of "Electrical Modernization" in the public mind.

The idea has already been launched in the slogan, "Be Modern, Live Electrically" which it is expected will dominate the promotional and sales activities of the power companies in 1954.

The necessity for adequate wiring will undoubtedly figure more largely in industry sales thinking.

Use of electricity in the home, as represented by annual residential energy sales, has increased rapidly since the end of World War II. This resulted from the conditions of the times. Those conditions are changing. Continuance of the rate of increase will more and more depend on improvement of wiring in 25 or more million existing homes. We can expect in 1954 to see many people who have heretofore considered adequate wiring to be somebody else's business suddenly discovering it is their own business.

The National Lighting Bureau, organized by NEMA late this year, is expected to get going on its task of setting up local bureaus in 1954 with resultant acceleration of commercial and industrial lighting sales activity.

References to Issues of Electrical World

1952
1. 9/22 p 118
10/20 p 102
11/3 p 84
12/1 p 94
12/29 p 64
1953
1/12 p 71
2/9 p 102
2/23 p 110
2. 5/18 p 141
3. 1/12 pp 110, 124
4/23 p 161
5/18 pp 148, 153, 159, 162
6/1 p 116
6/22 p 30
11/2 pp 80, 83, 84 86, 88, 91, 82, 94
4. 11/23 p 10
5. 11/30 p 70
6. 8/10 pp 87, 99
7. 3/23 p 113
8. 6/27 p 86
9. 9/7 p 67

Now, About Appliances

Ahead in 1954

Somewhat lower prices of appliances can probably be expected next year. There have already been some price reductions, also some increases, making the picture quite spotty. But the introduction of lower-priced lines by a few manufacturers is an indication that should not be ignored.

Appliance manufacturing capacity will probably rise in 1954, not alone by recently constructed plants getting into full production status, but also from some release of facilities from the pressure of defense production requirements. Whether this larger manufacturing capability will be reflected in output much increased over 1953 will depend on sales effort and market receptivity.

Other developments that can reasonably be anticipated are:

Continuation of rapid increase in sales of room air conditioners.

Color television on the market in limited volume.

Problem of the profit squeeze on distributors and retailers becoming more acute, causing a considerable mortality in dealer ranks.

More utilities entering or returning to appliance merchandising.

An unforeseen and large upsurge in public acceptance of room air conditioners and electric broilers was the outstanding feature of the appliance sales picture in 1953. Production of conditioners did not meet the sudden rise in demand, and distributor and dealer stocks were never sufficient. The broiler made the most impression in the larger northern cities where apartment dwellers are most numerous.

The increases in domestic loads caused by the phenomenal sales of these two appliances created difficulties for electric utilities as system loads built up in the warm summer months. Also in many places they turned inadequate wiring from a chronic problem into an acute one.[1]

Peak year in volume of appliance sales was 1950. Volume in each year since has been successively lower, pointing up with increasing force the necessity for greater emphasis on promotion and selling. The retailer can and should play a large part in this necessarily increased selling effort,[2] but to do so he must get a better deal in profit margin and in standing in the industry.

For the long pull over the years ahead appliance makers are optimistic, confident of the future market for their goods.[3] Appliance manufacturing capacity was considerably expanded during the year, leading some prophets to see a rather clouded picture of the years immediately ahead. This prospect, even if it turns out to be true, is not necessarily a wholly discouraging one because enlargement of manufacturing capacity is a long-term investment that looks beyond this year and next, that puts its faith in the general rising trend of the curve and is not disturbed by its short-time ups and downs.[4]

The year saw enlargement of product lines by several manufacturers as well as a number of new developments in major appliances. Among the latter were dishwashers on casters for buyers who have not decided where the machines are to be installed permanently, a combination clothes washer and dryer,[5] and larger ovens, faster surface cooking units, and deep fat fryers in ranges.[6] A convection-type heater that moves a large volume of air without using a fan or blower came on the market.[7] Also a room air conditioner whose operation can be reversed to provide heating made its bow.[8] Another new thing on the market was the infrared lamp as a range surface cooking unit.[9] The deep fat fryer made spectacular gains during the year.

Coordination of promotional activities between utilities and sellers of major appliances got off to a good start with the designation of April and May as months for campaigning ranges under the slogan, "Women Who Know—Cook Electrically."[10]

The 120-volt clothes dryer has been available from the first, but the 240-volt unit took over most of the market, being faster. But it appeared that more than a few housewives did not care how long it took the clothes to dry and the 120-volt dryer is looking up again.

Instances of mass installations of garbage disposers had been reported before, but the largest thing of this kind to date was noted in 1953—a real estate development of 17,000 homes each with disposer installed by the builder.[12] Another installation in 475 existing homes put the garbage man out of business in a Wisconsin village.[13]

The heat pump made considerable progress in 1953. The average of sales estimates by several manufacturers was 1,760 units in the year,[14] but it is likely that this figure will be exceeded. The first GE "Weathertron" sales branch was opened early in the year[15] and the company later announced reductions of 20 to 25% in prices of the machines.

Color television, except for limited showing, mostly demonstration and experimental, caused no great commercial furor during the year. It had been expected[16] to move along faster than it did, also that receiver prices would be about double those of black and white units. But the way had not been cleared by December 1 for commercial use of color broadcasting. This delay, plus the anticipated high cost of receivers, was undoubtedly a contributing cause to the maintained high volume of sales of black and white sets.

References to 1953 Issues of Electrical World

1. 7/27 p 77; 9/7 p 67; 11/30 p 76
2. 2/23 p 110
3. 5/18 p 142
4. 6/22 p 28
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DOUGLAS McKAY, Interior Secretary

ANCHER NELSEN, REA Administrator

W. A. DEXHEIMER, Reclamation Commissioner

After 20 Years,

The first Republican administration in 20 years, backed by a Republican Congress, charted a dramatically different course in federal power policy since taking over early this year.[1]

A comprehensive policy statement issued Aug. 18 by the Interior Department with President Eisenhower's personal endorsement provided a sharp contrast to the Democratic pro-public power policies of long standing.[2]

Chiefly, it placed greater responsibility on private enterprise and local public bodies for hydroelectric development—much less on the federal government. Also missing was the paternalistic attitude assumed by previous Democratic administrations.

It was made clear that the policy statement applied to all Interior agencies dealing with federal power development and marketing. These include Bureau of Reclamation, Bonneville Power Administration, Southeastern Power Administration, and the Southwestern Power Administration.

New attitudes rather than sharp shifts in policy characterized operation of Rural Electrification Administration.[3]

Less Money Handicaps Federal Agencies . . . Sharp trimming of federal expenditures for power facilities are sure to have a telling effect on the size of the government role in the power field.[4] Budget cuts hit such construction agencies as Army Corps of Engineers[5] and Tennessee Valley Authority. At TVA, Democratic appointees still

1954—More Tests For GOP Policy

Federal power policy will figure heavily in the Congressional elections.

Congress will attempt to write some ground rules for cost allocations on multipurpose water projects and may take a shot at clarifying federal power marketing procedures.

Compromises on administration power policy are likely as the policy is translated into action.

Public power advocates will try to fight their battle on TVA and rural electric co-op issues where they believe they can gain most political support.

Idaho Power Co may get a federal license to develop the Hells Canyon stretch of the Snake River, but another high federal dam proposal is in the offing.

Reports from the Hoover commission and other groups will urge less emphasis on federal activity in power development.

a New Federal Power Policy

ran the show and fought for federal appropriations in the face of GOP budget cuts.

TVA gave up its role as a White House pet,[6] and TVA backers were put on the defensive.[7]

A significant prelude to Interior's formal policy statement was its decision to step down as a special pleader for a high federal dam on the Hells Canyon stretch of the Snake River.[8] This opened up a larger role for Federal Power Commission in deciding on hydroelectric development.[9]

Hearings on the Idaho Power Co application to develop the Hells Canyon site followed[10] with National Hells Canyon Association trying to fill the void left by Interior.

Mark of the Interior policy was clearly evident in a series of power purchase contracts negotiated between BPA and several Northwest electric companies.[11] In theory at least, the contracts give utilities first call on purchase of federal power after preference demands are met.

Also following the new policy line was the federal power marketing criteria for the Missouri River Basin announced by Bureau of Reclamation.[12] Preference customers in the area protested that elimination of the "withdrawal clause" from contracts with non-preference customers would put rural co-ops at disadvantage.[13] Interior then eased the criteria to permit preference customers to recapture power taken by non-preference customers upon termination of short-term contracts.[14]

FPC Will Interfere Less with Business . . . Federal Power Commission, with a Republican majority, signaled it would keep interference with business at a minimum by ignoring effects of fast tax amortization in fixing electric rates.[15]

Congress, too, helped stamp the GOP emblem on the Southwestern Power Administration continuing fund. It voided a series of controversial lease-purchase contracts which had been negotiated by SPA and generating and transmission cooperatives.[16]

In trimming appropriations Congress stuck fairly close to the Eisenhower Administration revised budget.[17] A $60-million reduction in TVA funds foreshadowed a slowdown of TVA power expansion.[18]

House of Representatives, by a sizable majority, voted to let private enterprise develop an additional 1.1 million kw of power at Niagara Falls.[19] But the bill was halted in the Senate after intervention by Thomas E. Dewey, governor of New York, who is interested in having his state authority build the plant.

As important as any administrative or legislative action taken in the power field were the opinions handed down by state and federal courts interpreting existing law.

Vepco Wins Fight . . . The Supreme Court decision upholding Virginia Electric & Power Co's license to build the Roanoke Rapids project ended a long federal-private power fight.[21] It helped to clear the way for private enterprise to develop hydroelectric sites not specifically reserved for federal development. More important, it provided one basis for the administration's Hells Canyon decision[22] and the decision to withdraw from the Kings River case.[23]

Arkansas Supreme Court ruled that a G&T cooperative might not lease output of a steam plant to SPA and that SPA had no authority to purchase such power.[24] This ruling helped upset contract negotiations between companies and SPA for power interchange.[25]

Federal District Court for the District of Columbia turned out a conflicting ruling in upholding validity of contracts between Missouri G&T co-ops, REA, and SPA.[26]

A case arising from an accounting dispute between FPC and Niagara Mohawk Power Corp grew in significance when a court of appeals held state-granted water-use rights remain valid even when encompassed in a federally licensed project.[27] It drew national attention when New York Governor Dewey attempted to use it as a vehicle for gaining Supreme Court endorsement for state development of additional Niagara Power.[28]

Entrance of the Eisenhower Administration brought a host of new men to take over the key policy-making jobs in the federal power field.

At Interior, Douglas McKay, former governor of Oregon, moved in as secretary.[29] To help him form policy and administer power activities, he brought in Undersecretary Ralph Tudor and Assistant Secretary Fred G. Aandahl.[30] Wilbur A. Dexheimer was promoted to Commissioner of Reclamation.[31]

Democrats Still On Job . . . The Democratic-appointed heads of Sepa, SPA, and TVA were still holding their jobs. But Paul J. Raver planned to give up his post as BPA chief to become superintendent of Seattle City Light.[32]

Republicans brought in Ancher Nelsen to administer the Rural Electrification Administration[33] after Claude Wickard was displaced in the seventh year of a ten-year term.[34]

The Federal Power Commission and Securities and Exchange Commission were given Republican majorities, or at least majorities friendly to the Eisenhower Administration.[35]

In every part of the country organizations were springing up to fight parts of the growing GOP power policy. For the most part, these groups seem to draw their main strength from old-line public power pressure groups.[36]

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West Sees Merger Try and 20-Year Pact

Attempts to buy or merge Puget Sound Power & Light Co shared the spotlight with other significant events in the 11 western states in 1953, but the Puget Power controversy supplied the surprise turnabout. Both deals were firmly squashed when Puget Power's president Frank McLaughlin announced he would go it alone.[1]

However, he left the way open to Washington Water Power Co and the five Washington PUD's for future negotiations if the price is right. McLaughlin felt the outlook for continued operation had improved substantially since both offers were made. Nevertheless, 12 condemnation suits against the company by PUD's and municipalities are still pending.

A 20-year contract between Bonneville Power Administration and three private companies[2] was the result of negotiations started in the spring.[3] Portland General Electric Co, Pacific Power & Light Co, and Mountain States Power Co signed for 500,000 kw of firm power when it becomes avaliable. Following an allocation of 70,000 kw to BPA's industrial customers, the companies will be allocated the next million kw. Washington Water Power[4] became the fourth company to sign the 20-year agreement.

While preserving the priority and preference given to public power groups, the 20-year pact is viewed as the first long-term equitable contract.

Arizona Public Service Co entered into an agreement with the Bureau of Reclamation[5] that will integrate its 200,000-kw Saguaro station, now built, with transmission lines of the Davis Dam system. The bureau will wheel power from its hydro plants on the Colorado River and the steam plant to firm up the power supply in Arizona.

In striking contrast, there was anything but agreement over who will develop the controversial Hells Canyon project. Hearings before FPC on Idaho Power Co's application to build three low-head dams opened, recessed, and reopened throughout the year.[6] Hopes of federal development of the site cooled with Interior Secretary McKay's withdrawal of opposition to the application.[7] But advocates of the high dam formed the National Hells Canyon Association which joined with eight PUD's in filing an application to intervene at the hearings.[8] This was followed by a proposal by a group of PUD's to file a permit to build the high dam.[9]

The worst power shortage ever to hit the Pacific Northwest was marked by a spirit of cooperation as all customers and utilities worked to conserve energy.[10] But suit was brought against three private companies[11] to recover 11-20% surcharges necessitated by use of high-cost steam power. In November, however, the surcharge was upheld by order of the Oregon PUC. As an outgrowth of the shortage, BPA's research subcommittee proposed that BPA be given full utility responsibility, with authority to issue revenue bonds and buy power from non-federal sources.[12] Other Bonneville officials let it be known that its $17.50 per kw-year rate is due to increase 15-20% at the end of 1954.[13]

Major Northwest hydro projects completed during the year[14] that will help supply power this winter include the Bureau's 285,000-kw Hungry Horse Dam in Montana, Washington Water Power's 200,000-kw Cabinet Gorge Plant in Idaho, and Pacific Power & Light's 108,000-kw Yale Plant in Washington. An example of cooperation between public and private power was the installation of six 27,500-kw units[15] by Chelan County PUD at Puget Power's Rock Island Dam on the Columbia River.

In another move to supply power to meet shortages in the Northwest, FPC re-studied the proposed 230-kv interconnection between Oregon and California. It was reported feasible from engineering and economic standpoints.[16] However, BPA and the Bureau of Reclamation claimed the report was too conservative while Pacific Gas & Electric Co saw it as overly optimistic.

Construction of 274,000 kw of hydro capacity by Pacific Gas & Electric and 45,000 kw by the Fresno Irrigation District on California's Kings River was given the green light when Interior department urged that its request for review of FPC permits be dismissed.[17] Following discussions with a California delegation about purchase of the Central Valley Project,[18] Interior agreed to furnish data to establish the "present worth" of the project.[19]

Washington Water Power launched "The Leadership Campaign." ■ its first appliance sales promotion in a decade.

In the West Next Year

- **Federal power rates are slated to rise.**
- **Natural gas for the Pacific Northwest may be approved.**
- **Emphasis will be placed on partnerships in power production.**
- **Idaho Power faces court action if FPC licenses Hells Canyon project.**
- **Northwest private companies will intensify selling activities.**
- **Efforts will continue for purchase or merger of Puget Sound P&L.**

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Coming Developments in the Southwest

Integration of public and private power facilities.
Sale of some federally generated power to power companies.
Increased rates for SPA power.
Exclusive use of hydro power for peaking purposes in order to get the greatest value out of the limited water available.

Federal Power Slows in Southwest

Federal power progress in the Southwest didn't exactly cease in 1953, but its speed was greatly reduced. The Southwest Power Administration was hit hard when its funds were curtailed[1] and limitations placed on the use of its continuing fund.[2] A further blow was the ruling of the Arkansas Supreme Court that the Arkansas Electric Cooperative Corporation had no authority to build generation and transmission facilities for SPA use.[3]

However, in Missouri the SPA won a victory when a federal court upheld the legality of loan, lease option, and power contracts between five G&T co-ops, SPA, and REA.[4] Nine electric companies are appealing the ruling.[5] And a co-op is suing to force the government to honor the contract.[6]

SPA funds were cut for two reasons: 1. economy on the part of the Republican administration,[7] and 2. its lack of interest in building a federal power empire.[8]

Findings in the Arkansas case prompted Arkansas Electric to plan building its proposed steam plant in Oklahoma.[9]

All these developments pointed toward the working out of new agreements between the G&T co-ops and SPA and the negotiation of interim power contracts.[10]

There also were hints that private-public power problems could be solved if representatives of each would meet at the conference table.[11]

In an attempt to solve some of the public power problems in the Southwest, a four-state bloc of 159 co-ops has organized a new association, the Southwest Power Cooperative.[12] Objective of SPC is to solve the power supply problem of co-ops. It envisions integration of hydroelectric and steam power facilities in the area.

SPA Administrator Douglas G. Wright went on record early in the year by saying the cheapest way to solve the power problem in the area is through complete integration of all co-op, federal, and company systems.[13]

Possibility of higher SPA power rates was also suggested early in the year by Wright[14] and repeated in a more positive vein later.[15] In an SPA budget hearing Wright said, "I want to explode the myth that hydroelectric power is necessarily cheap power."

A big factor in the SPA rate problem has been the low water supply for hydro plants in the Southwest. River flows in the vicinity of four projects on the SPA system ranged from 67% to 24% of the stream flow for the first 10 months of this year.[16]

Republican administration policy loomed large in the shaping of events in public power in the Southwest. Secretary of Interior McKay made several pronouncements on policy during the year. He said he is not in favor of the sale of government dams, he is not interested in building a federal power empire, and he believes in the government building multi-purpose dams.[17] In speaking on the government building transmission lines McKay said he did not like duplication.[18] He does not think the federal government should get out of the power business.[19] He thinks public power is here to stay.[20]

Farther to the Southwest, Falcon Dam, the new international project on the Rio Grande, was dedicated with the presidents of Mexico and the United States participating.[21] Power facilities provided will be 31,500 kw for each country, Mexico and the U. S. Power production will be incidental as water will be passed as required primarily for irrigation.

Water supply continued to be a problem for Southwest power suppliers. Indications were that if a drought were prevailing it was only a normal one. This would mean continued trouble for those operating hydro installations. It could also mean more reliance on the federal government.

Scarcity of water also leads to increased pumping by farmers for irrigation. In time this can bring a greater demand on their part for federal irrigation projects. And such projects offer a good excuse for a power installation to defray part of the costs.

Generating capability presents no problem in the area. The big peak comes in the summer months, and in 1953 the reserve was 12.7%. For 1954 the prediction is 19.4%, according to Edison Electric Institute.

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16. 11/23 p 6
17. 1/26 p 120
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Politics and Niagara Power Development

Five electric companies seeking authorization to develop additional power at Niagara Falls will have their best chance for success if they press their fight for final Congressional approval early in 1954. If the matter is not settled before the 1954 election campaign gets under way, Niagara power will be a hotly debated issue on a national and state level.

Many Democrats in Congress have been highly critical of administration power policies and some have labeled the private enterprise bill a giveaway.

In the New York State gubernatorial election, the two likely candidates are Gov Thomas E. Dewey and Rep Franklin D. Roosevelt, Jr. Dewey is battling for state development with no preference in sale of power. FDR, Jr, will amend his bill calling for federal construction to allow state to do the job but insists on a preference clause. If they should oppose one another, Niagara power is sure to be an issue. And regardless of the winner, utilities would have an opponent to private development in Albany.

Northeast Hydro Projects Stir Debate

For utilities the big news in the Northeast in 1953 centered around two proposed hydroelectric developments on the St. Lawrence and Niagara Rivers.

In the case of the St. Lawrence, it appears fairly certain that the State Power Authority of New York will be able to begin actual construction next summer of its half of a 1.8 million-kw project being undertaken by the United States and Canada.

But just who will develop an additonal 1.1 million kw at Niagara Falls is still anybody's guess. Five private utilities in New York, New York State Power Authority, and the federal government all have different plans.

During the 83rd Congress bills providing for development by the private companies, the New York Power Authority, and the federal government were introduced.[1] The Capehart-Miller-Dondero bill, backing private development, got off to a fast start. Joint hearings were held by the Senate and House Public Works Committees in May,[2] and the following month the House group reported out the bill favorably.[3] Then the House passed the private development bill by a whopping majority.[4]

Capehart-Miller-Dondero bill was expected to clear the Senate Public Works Committee without trouble, but last-minute intervention by Gov Thomas E. Dewey of New York prevented this.[5] Dewey, who would like to see the additional Niagara power developed by New York's Power Authority, succeeded in getting the Senate Public Works Committee to hold up its action on the private companies' bill and to reopen the hearings. He then appeared as a witness before the committee, urging approval of the state development (Ives-Becker) bill and threatened court action to prevent private development.[6]

A Supreme Court decision, in a case involving Federal Power Commission and Niagara Mohawk Power Corp may have an important bearing on the outcome of the controversy over further development of Niagara power. The case, involving an accounting dispute, assumed sizable proportions when U. S. Court of Appeals backed Niagara Mohawk in holding that a state's water-use rights do not "evaporate" within the area of a federally licensed hydro project.[7] FPC took the case to the Supreme Court.

A few days before the case was scheduled to be heard before the high court, New York State filed a brief as a friend of the court stating that Niagara Mohawk had acquired no proprietary rights from the state over waters of the Niagara (as Niagara Mohawk maintains) and that state proprietary rights are not superseded by Federal Power Act (as FPC contends). The eleventh-hour state brief has been interpreted as a bid by New York for court endorsement of control over new Niagara projects.[8]

While the dispute over Niagara power promises to be a lively issue in 1954, the question of who shall develop the power potential of the St. Lawrence is all but settled.

New York State Power Authority won backing of FPC's staff early in 1953 after the staff had recommended dismissal of application of Public Power & Water Corp, Trenton, N. J., on grounds that the company had shown no financial ability to undertake the project.[9] In May FPC Examiner Glen Law ordered issuance of a 50-year license to the state agency.[10] In June opponents of the New York plan—Public Power & Water, coal, port, and landowner groups—presented argument before the full commission in opposition to the granting of the license to the New York agency.[11] Nevertheless, FPC went ahead and granted a license to the State Power Authority.[12] Public Water & Power and other opponents then brought suit to bar issuance of the license to New York. Court heard oral argument in the case last week.[13]

Last month State Power Authority formally accepted the FPC license and President Eisenhower designated the agency as the U. S. partner in the joint American-Canadian project. The authority then went ahead and named two engineering firms to proceed with studies.[14]

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Private Power Gains in Southeast

This year brought a significant victory for private power in South Carolina when Comptroller General Lindsay Warren ruled on Jan. 7 that federal funds for the construction of a government-owned transmission line between the government's Clark Hill hydroelectric project on the Savannah River and the Greenwood County Electric Power Authority be withheld.[1]

Some $800,000 had been appropriated by Congress for construction of the line by Southeastern Power Administration, providing that all revenues for wheeling the power over privately owned lines had been exhausted. In spite of offers by the South Carolina Electric & Gas Co to either wheel the power over existing facilities or to build a new line if desired, Sepa went ahead with the construction. Duke Power Co, which formerly served Greenwood County, joined South Carolina E&G in a suit seeking a restraining order against Sepa. In the meantime, construction of the line was practically completed.

Subsequently, the Department of the Interior's appropriation bill passed by the Senate the latter part of May authorized that the line be sold to the Greenwood County Power Commission, operators of the county controlled project.[2] Other South Carolina lines proposed by Sepa were denied funds by the Congress.

Just a few days prior to the ruling on the hotly contested transmission line, power from the first of seven proposed generators at Clark Hill was delivered to Santee Cooper (South Carolina Public Service Authority). This power firmed up the production at Santee Cooper's hydro plant which was suffering from the extended drought.

On Sept. 8, an $800,000 building was opened at Moncks Corner, S. C., headquarters of Santee Cooper operation. Then on Oct. 17, the first of two 50,000-kw units from its Pinapolis steam plant went on the line, and plans were announced for the addition of four units to the two presently planned.[3] Ultimate capacity of the plant is 300,000 kw. Estimated cost of the first two units was roughly $14,300,000 and was financed on the open market. Santee Cooper serves several industries and municipalities as well as members of the Central Electric Power Cooperative, a "super-co-op" formed to construct the contested transmission system in central and southern South Carolina which largely duplicated the existing system of South Carolina E&G. Central secured some $9-million from the REA under the old administration for the purpose, and the system is practically completed.

In spite of the seemingly formidable county, state and federal competition, South Carolina E&G proceeded with its multi-million dollar expansion program which included the completion of a 200,000-kw steam plant, Urquhart Station, on the Savannah River, four miles below Augusta, Ga. The first 75,000-kw unit went into service in December, and a second will follow in January. The housing for the third unit (100,000-kw) has been started.[4]

Urquhart Station is being built by South Carolina Generating Co, a wholly-owned subsidiary. On completion of the second unit, an agreement with the Atomic Energy Commission goes into effect for the delivery of 30,000 kw to the H-bomb materials plant on the Savannah River about 17 miles south of Urquhart.

Test case for disposal of power from federal hydro plants in the Southeast is the contract for power sales in Georgia from the Clark Hill plant. Temporarily this power is being sold to Georgia Power Co under an interim contract due to expire Jan. 1.[5] A decision on a permanent contract is expected before this date.

Half of the ultimate 280,000-kw Clark Hill capacity has been allocated to Georgia, although only about 35% is firm power. Georgia Power is the sole transmitter of this power from the bus bars to the preference customers and other customers in its system. It proposes to firm up and deliver Clark Hill power to the preference customers designated by the Interior Dept—these customers to remain customers of the Georgia Power Co.

This proposal is being opposed by 38 Georgia co-ops who want the Clark Hill power sold directly to them as preference customers—and not through an agent, as Georgia Power proposes. There were indications a few weeks ago that the issue was about to be settled in favor of the Georgia Power. The matter had been placed before the President at a Cabinet meeting, and it was reported that he expressed his approval of the utility offer. Then the Georgia cooperatives engaged Georgia's former Gov Ellis Arnall to press their case. It appears that the new momentum provided by Arnall is the major factor in prolonging the time for decision.

Vepco is continuing construction work on its $30,-million, 100,000-kw Roanoke Rapids hydro plant.[6] Vepco has applied to FPC for a construction license for a 87,000-kw hydro plant 10 miles upstream from Roanoke Rapids at Gaston, N. C. Estimated cost is $27-million.

Predictions for 1954

- **Hydro construction by private companies will increase.**
- **Georgia Power's proposal for Clark Hill will be favored but probably in modified form.**
- **Present policy of denying funds for future federal transmission lines will be continued.**
- **Co-op-private utility relations will continue to improve.**
- **Private utilities may lose a few more co-op customers to public power.**
- **Municipals will continue to purchase more power from utilities.**

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REGULATION

Illinois Reaffirms 'Fair Value' Stand

Reaffirmation of the "fair value" principle and a quick reversal in the working capital formula in Illinois were probably the most important regulatory developments of the past year. On April 15 when the Supreme Court of Illinois handed down its decision on Illinois Bell Telephone Co vs the Illinois Commerce Commission, it said:

"The ICC must use a rate which represents the present fair value of the utility property, arrived at after full and proper consideration of reproduction cost, and a reasonable return based upon an appraisal of the opportunities available for investment in other enterprises."

In the Peoples Gas Light & Coke Co case of May 28 the ICC found a 5.80% rate of return on a "fair value" rate base which was 31% in excess of net original cost depreciated.[1]

The ICC, on Sept. 28, gave the Iowa-Illinois Gas & Electric Co a rate of return of 5.80% on the "fair value" of its properties in Illinois. This rate base was 34.5% in excess of a net original cost rate base.[2]

The Superior Court of Mecklenburg County remanded the Southern Bell Telephone & Telegraph Co case to the North Carolina Public Service Commission for a redetermination of a rate base on a "fair value" principle on Aug. 24. In addition, it ordered the PSC to consider the equivalent of economic depreciation by saying:

"It appears that the commission did not allow as an expense of operation an amount estimated and determined by it to be a depreciation allowance reasonably sufficient to restore currently the portion of capital investment currently consumed. The court is of the opinion that the commission must do so." The case has been appealed by the state to the Supreme Court of North Carolina.

The Maine Public Utilities Commission, on Nov. 6, granted an increase of $1,422,000 on an application by the Central Maine Power Co for additional revenues of $3,284,389.[3] It is of interest to note that while the Maine law requires the determination of "fair value" for the rate base, the commission gave an amount equal to only 3% in excess of the net original cost rate base of the company, and, in addition, found that 5.9% represented a fair and reasonable return on that rate base.

On the question of the working capital principle the ICC in the Peoples Gas case of May 28 still adhered to the principle that working capital, apart from materials and supplies, could be supplied from funds arising from the federal income tax accruals.

Significantly, the ICC reversed itself on this question in the Iowa-Illinois case of Sept. 28 when no deduction was made for federal income tax accruals.

In rate increase proceedings before the Florida Railroad & Public Utilities Commission, Florida Power Corp, on July 23, received a $1,265,000 rate increase.[4] While the original cost rate base is mandatory in that state, the commission allowed the company a 6.45% rate of return on a year end rate base. The commission deducted a portion of federal income tax accruals from working capital and dismissed the company's petition to include electric plant acquisition adjustments in the rate base. It is significant, however, that the commission ordered the company to propose fuel and commodity adjustment clauses for the commission's consideration.

While the petition for economic depreciation was disallowed in the Iowa-Illinois case because the ICC had to decide on a separate docket dealing with depreciation in relationship to the securities provision of the Illinois Public Utilities Act, the wording of the decision was such that economic depreciation would be entitled to further consideration once the depreciation docket was settled.

The Connecticut Public Utilities Commission on Oct. 20 allowed 55% of the proposed $2,133,385 electric rate increase filed by the Connecticut Light & Power Co.[5] The PUC set the rate of return at 5.6% as opposed to a rate of return of 5.95% which the proposal of the company would yield on the rate base.

It is significant that in its conclusions the PUC said:

"The company states in at least three places in the record, including its brief, the testimony of the company's president and of its financial analyst that a return higher than 5.52% is not asked for in this proceeding because it feels it can obtain additional revenues through more efficient operation."

Another important rate decision was that of the Georgia Public Service Commission in the case of Georgia Power & Light Co in its application for a rate increase.[6]

While allowing an increase of $128,401, the PSC raised the issue of whether the supply taken by the company from its affiliate, the Florida Power Corp, was the most economical one under the circumstances and whether cheaper sources of power could not be made available from the Georgia Power Co.

Developments Ahead in 1954

Continuation of the "fair value" principle in the determination of the rate base.

Greater recognition to rate of return rather than to strict "cost of money" doctrine.

Continuation of working capital based on federal income tax accruals.

Further rate increases.

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6. 11/16, p 137, 138, 224

Companies Adopt Fuller Programs

Public relations and advertising activities of electric companies reached a "plateau" in their growth in 1953. This gave them an opportunity to consolidate the great gains they have made since 1945. Most companies used the time to complete an across-the-board public relations program by adding activities other companies had used successfully.

The change in administration at Washington had a great effect on public relations activities of business-managed companies. They were left in the dark on federal power policy until late in August.[1] When the Interior Department did make a statement, Robert E. Ginna, chairman of the Electric Companies Public Information Program steering committee, was quick to issue a statement.

More Action Requested . . . He called for an intensification of informational activities such as PIP and the Electric Companies Advertising Program "to strengthen the hands of those who have the power and the will to implement the wishes of the people by their acts and influence."[2]

Nationally the two big campaigns by private companies were holdovers from 1952. These were the campaign of the five New York companies to redevelop Niagara and of Idaho Power to build three low dams on the Snake River in place of the high one planned by the federal government for Hells Canyon.

Associations Strong . . . PIP and ECAP showed considerable strength throughout the year. Most companies showed greater willingness to cooperate in exchanging information. Edison Electric Institute showed a new awareness of the importance of public relations by devoting one session of its annual meeting to speeches on public relations subjects.[3]

Advertising to inform the public of the companies' viewpoint[1] on their struggle with federal power changed sharply in tone. Practically all companies adopted the positive approach; that is, they advertised their own achievements instead of condemning public power. All four winners in the Reddy Kilowatt advertising contest for the best ads on this subject used the positive approach.[4]

Promote Local Areas . . . Area development became practically universal.[5] Where any effort is being made to attract new industry, the local power company is almost without exception the force behind the campaign. In non-metropolitan areas where people once could turn only to the government for aid in bettering their living standards, they now are turning to the electric companies.

Utilities attempt to attract new industries,[6] foster community development,[7] aid farmers,[8] sponsor recreation areas,[9] and promote modern electrical living.

Sponsored by PIP companies, an Electricity for Better Living program won nationwide support. One feature of this was the cooperation of the major baseball leagues in observing the anniversary of night baseball.[10]

ECAP Expands TV Show . . . ECAP continued its advertising in nationally circulated magazines. It also sponsored the radio program, "Meet Corliss Archer," and the TV show, "You Are There." But in 1954 ECAP will drop radio and extend its TV program to at least 94 stations, giving practically nationwide coverage.[11]

Clients of Reddy Kilowatt Service, Inc, got behind a youth-parents program[12] to inform children, as future customers and as influencers of their parents, on the industry. Similar youth activities had been conducted in the past but only in a spasmodic manner by individual companies.

PIP held its fourth workshop conference[13] and gained nationwide publicity when AEC Commissioner Thomas E. Murray announced in his speech that the government would build a nuclear power plant.[14] As a sign of the growing interest of the industry in nuclear energy, PIP issued a nuclear power kit to aid public relations directors tell the story to the public.[15]

Cooperatives showed that they are beginning to realize the importance of good public relations.

Light's Diamond Jubilee—Top Activity in '54

Light's Diamond Jubilee, with all segments of the electrical industry participating, will overshadow all other public relations activities.

Television will grow in importance as an advertising and public relations medium.

More attention will be given to informing the public about nuclear energy.

Youth programs will get more support.

There will be a marked advance in the exchange of information and public relations methods among companies.

Cooperatives will improve their public relations programs as they grow in size.

References to 1953 Issues of Electrical World

1. 8/24 p 102
2. 8/31 p 6
3. 6/15 p 108 ff
4. 9/7 p 74
5. 11/30 p 96
6. 11/30 p 96
7. 3/2 p 16
8. 5/4 p 84
9. 6/29 p 77
10. 5/11 p 10
11. 12/14 p 115
12. 6/1 p 58
13. 11/16 p 130 ff
14. 11/2 p 74
15. 10/19 p 130

Financial Highlights of the Coming Year

Interest rates will stay around present levels or go lower.
"New money" financing will continue at a high rate.
Common stock dividends will go up.
This will be another high year for common stock financing.
Total electric operating revenues will top $7 billion.
Net income of power companies will hit another record high.
Stock market is expected to remain steady.

FRB Policy Change Boosts Bond Prices

The change in electric utility bond prices, sinking to new postwar lows in June and snapping back rather sharply in September, was the outstanding development in the financial field during the year. Although bond prices showed a gradual two-year downtrend because of Federal Reserve Board policy not to support pivotal Treasury issues, a sharp drop came in the middle of April and continued until mid-June.[1]

First quality electric company bond yields as reported by Reis & Chandler, Inc, jumped from 2.64% on Jan. 4, 1951 to 3.19%[2] by mid-April of 1953. By the end of that month yields had gone up to 3.34%[3] and by June 18 they had hit a high of 3.37%.[4]

This uptrend in bond yields was due to many factors. One of these was the entry of the United States Treasury into the market to float a $1 billion, 30 year, 3¼% bond issue. Almost every one thought that these bonds would come out at a premium. But when the issue began active trading on April 22, these highest grade bonds were not able to sell for less than a 3.25% return. Today this issue is selling around a 3.00% yield.

During this period, some companies, needing money to take care of their large construction programs, had to pay these high interest rates. Pacific Gas & Electric Co in May sold a first mortgage bond issue to underwriters which was resold to the public at a 3.90% return. In March 1952 this company had sold to the public a comparable issue which yielded 3.28% and in June 1950 had sold an issue to yield 2.77%.

References to 1953 Issues of Electrical World

1. 8/10 p 97
2. 4/20 p 124
3. 5/11 p 45
4. 6/29 p 94
5. 12/21 p 48
6. 11/30 p 99

Another issue sold in this period was Philadelphia Electric Co's 30-year first mortgage bonds. This was offered to the public at a price to yield 3.73% in May 1953 while the same company was able to attract investors with a 3.20% return in January 1952. Bond prices came back so fast after the middle of September that the company was able to sell another issue to the public on a 3.15% return in December 1953.[5]

Since June 18 when first quality electric company bond yields hit a high of 3.37%, they have been steadily coming down. By the end of September they had declined to 3.30%, and by the end of November they made a further decline to 3.10%.

This improvement in the bond yields was brought about by the Federal Reserve Board purchasing Treasury bills along with the easing of member bank cash reserves requirements and the attractive returns of high quality bonds brought investors back into the market.[6]

The electric utility companies will sell publicly nearly $1.7 billion of "new money" securities in 1953. Of this total, $1.0 billion will be in bonds and debentures, $525 million in common stocks, and only $175 million in preferred stocks.

If this "new money" financing is added to the nearly $200 million direct sales to insurance companies, banks, pension funds, and similar buyers and nearly half a billion of dollars of bonds and notes sold by the Ohio Valley Electric Corp and Electric Energy, Inc, the industry will sell over $2.3 billion for 1953. This will be another record high and will exceed 1952 by more than $500 million.

During the second quarter of 1953 when interest rates were the highest since the middle thirties, the electric companies sold publicly a record $343.3 million in "new money" debt as compared with the former high of $341.8 million sold in the like quarter of 1952.

Preferred stock sales to the public practically came to a standstill in the third quarter of 1953. Wisconsin Power & Light Co was the only one selling an issue to the public. It amounted to $2 million.

Pacific Gas & Electric Co's common stockholders continued to subscribe to the company's offer to buy stock under a "rights offering." This is the seventh time since the end of World War II. Each time subscriptions have been around 98% of the shares offered for sale.

Total electric operating revenues will hit over the $6½ billion mark for 1953, another new top for the industry. All major classifications will show increases with the largest being in residential which will jump around 10%.

Net income of power companies, likewise will hit another new top in 1953. This will be the first time that net income has gone over the billion dollar mark. It is interesting to note that net income for 1953 will be over twice that reported for 1942 when $499 million was reported.

Electric companies continued to increase their common stock dividends during the year as earnings went higher. For the first nine months of 1953, there were 42 dividend increases by 40 companies. This compared with 28 companies in the like period of 1952. The latter figure included 13 which again increased their dividends in 1953.

Nuclear Power: Who'll Develop It?

The question of who would develop commercial power from the atom for the most part overshadowed the question of how it would be developed.

Perhaps the best indication of the trend was the release last April of Atomic Energy Commission's proposal for changing the Atomic Energy Act of 1946 which forbids private ownership and development of nuclear fuels and reactors.

The proposals, if adopted by Congress, would provide the basis for development of an atomic power industry in this country. Changes suggested would permit private utilities and other private firms to own and operate nuclear-fueled plants and produce electric power from them for commercial distribution. The Commission's plan had the blessings of President Eisenhower and the National Security Council.[1]

Biggest spot news this year in the field of nuclear power in the United States came in October. Then the AEC announced it planned to build the nation's first large nuclear-fueled power plant at one of its separation facilities. Most likely spot mentioned for the 60,000-kw installation: Portsmouth, Ohio. Cost was estimated at $30 million. Westinghouse Electric Corp was named as the contractor.[2]

Here is a chronology of other important developments in the field during 1953:

In January the National Production Authority announced that plants which will supply power to atomic energy installations would be given top priority for materials and equipment.[3] By March, 43 utilities had been certified for this priority.[4]

Oak Ridge National Laboratory announced that useful amounts of power from nuclear energy had been achieved from successful operation of a new type reactor—an experimental homogenious reactor. On Feb. 24, the announcement said, 150 kw was produced.[5]

Rep Sterling W. Cole (R-N.Y.), a supporter of private industrial development of atomic energy, was appointed head of the Joint Congressional Committee on Atomic Energy early in April.[6] AEC's plan was made public shortly afterward. Atomic Industrial Forum, Inc, was formed the same month. The forum, an industry association to promote private development of nuclear energy, later elected Walker Cisler, head of Detroit Edison Co, as its first president.[7]

Congressional hearings began in Washington in June on the AEC plan to keep the atomic bomb and release the atom for private development.[8] Congress shortly began setting up a timetable for removing the legal barriers to private development. Schedule called for legislative action early in the 1954 session.[9]

Gordon Dean, retiring chairman of the Atomic Energy Commission (succeeded by Adm Lewis L. Strauss) announced that month that Argonne National Laboratory had used a reactor to demonstrate successfully the principle of breeding. In the process, the reactor "burned" U235, changing non-fissionable uranium into fissionable plutonium at a rate at least equal to the rate at which the U235 was consumed.[10]

The industry feasibility study teams were realigned in September, dissolving the former five-team setup.[11] New alignment saw Duquesne Light Co and Walter Kidde Nuclear Laboratories enter the field as a separate team. Dow Chemical Co-Detroit Edison Co team continued as before, as did Pioneer Service & Engineering Co-Foster Wheeler. Monsanto Chemical Co, formerly allied with Union Electric of Missouri, went on independently, and Union Electric joined forces as one team with Commonwealth Edison Co and the Pacific G&E-Bechtel group. This combined organization took in a fifth partner, American Gas & Electric Service Corp.[12]

October saw General Electric Co propose to build a dual-purpose reactor, at government expense, to supply power needs of AEC's Hanford Works and contribute energy to the Northwest Power Pool.[13] The AEC announcement that it planned to build a commercial-size single-purpose reactor at a gaseous diffusion project in the East followed two weeks later.

Private nuclear power development was urged by most of the speakers at the Second Annual Conference on Atomic Energy Sponsored by National Industrial Conference Board in New York at the end of the month. One notable objector was A. O. Knight of the CIO.[14]

Nuclear Power Predictions

Congress, while inclined to adopt legislation that would let private industry develop the atom for commercial power, may run into election-year difficulties that would make it postpone action until the 84th Congress takes office a year from January.

One of the major industry teams will announce it is ready to go ahead and build a full-scale single-purpose reactor for industrial use, reactor to be built without government subsidy.

Atomic Energy Commission will come out with a five-year power reactor research program.

The United States, Britain, and France will agree to release and exchange a greater amount of classified material leading toward industrial development of atomic energy. AEC will produce a more definite policy on the amount of reactor information that can be released under present law.

One or more private industrial firms will participate financially with AEC in building and operating the commission's first utility-sized power reactor.

References to 1953 Issues of Electrical World

1. 4/20 p 106
2. 11/2 p 74
3. 2/2 p 7
4. 3/9 p 74
5. 3/16 p 46
6. 4/13 p 18
7. 4/20 p 106
8. 6/1 p 64
9. 6/29 p 67
10. 6/15 p 103
11. 8/31 p 24
12. 9/7 p 71
13. 10/26 p 8
14. 11/9 p 6

Predictions on Power Aboard

Interchange of power will be stepped up among Western European countries with installation of more and better transmission facilities.

France and Britain may be linked by construction of the much-talked-of submarine cable under the British Channel.

Japan will step up purchase of power machinery in the United States as her long-range construction program gets under way.

With expansion of its Miguel Aleman System and other power facilities Mexico will make it a three-way race with Argentina and Brazil for first place in Latin American power generation.

Germany may enact new tax writeoff laws to encourage building of much-needed transmission links.

Atomic energy and wind generation will be given intensive study as the search for new sources of power in Europe continues.

World's Power Shortages Becoming Less Acute

Around the world the story was the same: The power shortage remains. But this year some countries were able to say the corner had been turned, that the possibility of catching up did not look quite so bleak. But progress was spotty, dependent as always on availability of the two big x-factors, money and machinery.

Early in the year, Mexico tried to surmount the money difficulty by issuing $15 million in bonds to increase its federal power system. The bonds would be used to cover purchase of five small utilities.[3]

Just about the same time, Turkey reported it had put into operation an extensive program of hydro development. Eight stations, with a combined capacity of 222,145 kw, are under construction, and six more, with 226,280 kw, are projected.[8]

In February the Sao Paulo-Santos area of Brazil, Latin America's largest industrial community, was in the midst of a severe shortage. The situation will be much relieved when Sao Paulo Light & Power Co brings in its 160,000-kw Piratininga Plant near the state capital.[8]

The Soviet Union, in a broadcast monitored for McGraw-Hill World News, said it was planning to exploit the hydro resources of the Angara River, with a potential of 60 million kwhr a year, to develop aluminum, coal, metallurgical, and salt industries in the area.[4]

Sweden announced it would begin building its largest hydro station this year on the Ume River near the Gulf of Bothnia. The plant, to be called Stornorrforsen, will have a capacity of 375,000 kw.[5]

Before the shooting stopped in Korea, United Nations forces had moved in three power barges to offset the acute power deficit caused when the Communists cut off power from the north. For months, the Jacona, Impedence, and Saranac kept South Korea and UN troops in power, pending reconstruction of land stations.[6]

Britain began looking to the wind for a partial solution of its electricity problem. A 100-kw, depression-type anemoplant was completed by April. If the experiments prove successful, more and larger plants will be built and installed in areas of high and constant winds, probably along the coastline.[7]

El Salvador began building an underground hydro station of 33,334 kw on the Rio Lempa. Plant will be called "Guayabo".[9]

Egypt's Aswan Dam astride the Nile River got a boost toward completion when a Swedish engineering firm submitted plans for the project's 368,000-kw power plant. Machinery was scheduled for delivery next year.[9]

Canada has scheduled 830,000 hp of hydroelectric additions for this year, another 1.5 million by 1955. Nuclear power generation is being explored for some hydro-short areas such as Southern Ontario, but hydro will continue to be the answer to Canada's industrial expansion.[10]

France will continue to live in the shadow of a power shortage, even though $3 billion has been spent on construction in the last six years, doubling 1946 capacity. Rationing was discontinued in 1950 but may have to be reinvoked. Atomic energy is considered by many in France as a possible solution to the problem.[11]

In August Great Britain energized the first section of its 275-kv super grid—42 miles between West Melton and Staythorpe.[12]

West Germany's problem is not generation but transmission. What is needed, industry leaders told a McGraw-Hill correspondent, is tax relief to make it possible to build the lines to distribute power already available from the country's steam plants.[13]

Yugoslavia decided to export power to the West—Austria, Italy, and West Germany—for the first time. Plans are being made for large-scale expansion of the country's water resources.[14]

Japan still suffers from winter hydro shortages, and with 1,264 hydro plants to 83 thermal, that means power in general is in short supply.[15]

Finland, deprived of one third of its capacity by the Russians during World War II, is turning north to the Kemi River for power. The Kemi, with a third of the country's hydro potential, is the last major source to be developed. Construction has begun on seven plants there.[16]

References to 1953 Issues of Electrical World

1. 2/2 p 34
2. 2/2 p 22
3. 3/2 p 8
4. 3/2 p 24
5. 3/2 p 24
6. 3/16 p 22
7. 4/13 p 32
8. 4/27 p 22
9. 5/11 p 20
10. 5/25 p 16
11. 7/6 p 16
12. 8/31 p 32
13. 8/31 p 22
14. 9/14 p 34
15. 10/26 p 22
16. 11/9 p 33

Management Trains for New Tasks

Selection and training of present and future top executives held the spotlight in the industry's meetings and activities in the management field in 1953. Ernest R. Acker, president, Central Hudson Gas & Electric Corp, whose program has received wide attention, pointed out that "the quality of our leadership must be improved and the performance of our organizations upgraded if we are to meet the challenge of the postwar economy and provide for the future demands of our customers."[1]

Looking to colleges for future management material, American Gas & Electric Service Corp held an all day meeting in New York City with 43 faculty members representing 16 eastern engineering colleges.[2] The feeling grows that college students, being the best source of future management men, should be convinced that the utility business is a good one to be in, that the company has a definite training and development program; that the starting salary is in line with what others pay for comparable work, and that the company is particular about whom they hire.[3] In line with the trend, better utilization of engineers was a subject of wide discussion at the Fifth College Industry Conference at Northwestern University. Titus G. LeClair, manager of engineering for Commonwealth Edison Co, stated that requiring an engineer to handle all the details of his job is "our greatest source of wasted engineering talent."[4]

Improvement in existing management received more attention as a carefully chosen group of 20 Cleveland Electric Illuminating Co executives completed the company's first course in "Progressive Management." The 11 lectures were given by such men as Lawrence Appley, president American Management Association and Dr Leo Wolmon of Columbia University.[5]

The College of Engineering, State University of Iowa, held its 14th summer management course.[6] And the program for utility executives to return to school was given renewed emphasis as the Southeastern Electric Exchange sponsored a new four-week course at the Georgia Institute of Technology. For a month (July) 46 industry men went to class to hear 28 authorities on utility operations. They received instructions designed to increase the skill of utility executives in policy-making and long-range planning.[7]

Employee training takes a new twist at Public Service Co of New Mexico. Through cooperation with the extension service of University of New Mexico, employees of the company's power production department are instructed in practical techniques of steam station operation. They also learn how to become instructors in company's regular apprentice training program.[8]

Utility company-sponsored supervisory training programs continued to provide important benefits in handling the industry's rapid expansion. The successful use of this management tool by Arizona Public Service Co, where employees almost tripled in five years, gives added proof of its continuing value as a tool in management development.[9]

Widening the approaches to management training, one finds progress in the field of two-way communication in Virginia Electric & Power Co's bi-monthly meetings[10] and new techniques in "Better Communication" in such programs as American Gas & Electric Service Corp's slide films for supervisors.[11]

All of these activities in the field of management improvement seem to be based upon a new and expanded concept of management responsibilities to the service area. These were well summarized at the EEI Industrial Relations Committee's annual round table conference. George Gadsby, president, Utah Power & Light Co, listed these responsibilities as:

1. Furnishing an adequate supply of electricity with a maximum degree of continuity.
2. Foreseeing and building the necessary equipment required for supplying the constantly increasing requirements of electricity today.
3. Procuring funds from outside sources to pay for the never-ceasing utility construction programs.
4. Earning a return with which to pay the hire of borrowed money.
5. Paying dividends to those purchasing the equity securities of electric utilities.
6. Promoting new and more use of electricity.
7. Planning area development.[12]

Management Trends in 1954

More of management men's time will be alloted for purely training activities.

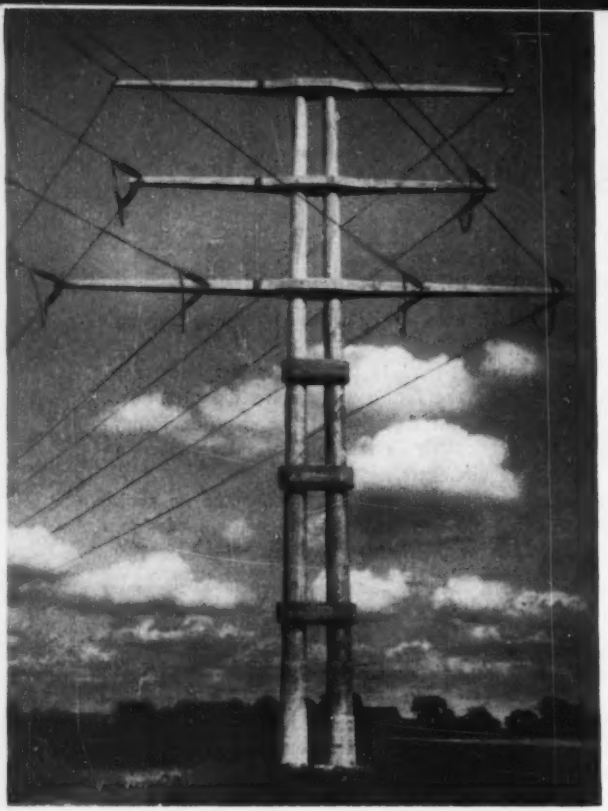
Electric rate adjustments designed to provide for the important heating and cooling loads of the future will receive top attention.

Cooperative planning among all segments of the electric utilities will gain in importance particularly in the field of interconnection and generating capacity requirements.

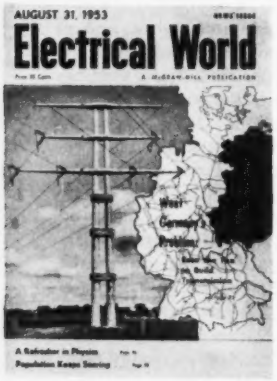
As generating capacity requirements begin to catch up on peak load, management will turn more attention to economies in design, operation, and maintenance of distribution systems.

References to 1953 Issues of Electrical World

1. 10/26 p 35
2. 1/5 p 37
3. 6/15 p 111
4. 2/16 p 40
5. 3/30 p 35
6. 5/11 p 35
7. 7/27 p 84
8. 3/30 p 18
9. 7/20 p 22
10. 6/8 p 16
11. 6/22 p 32
12. 10/26 p 34



MYSTERY PICTURE



When this picture appeared on EW's cover Aug. 31, it brought a flood of inquiries from sharp-eyed, curious readers. It *is* a concrete mast. To answer all your questions, EW asked its correspondents in Germany to check into the details. This article tells all they learned about concrete poles.

There's no mystery any more about . . .

Making Concrete Poles in Germany

ANDREAS KEMMELMAIER, Chief Engineer, Fraenkisches Ueberlandwerk AG, Nuernberg, Germany

Low cost concrete poles for Germany's power lines are successful substitutes for wood poles. During the past five years, Fraenkisches Ueberlandwerk AG of Nuernberg has used concrete poles on all new construction of feeder and connecting mains for voltages from 6 to 60 kv. More than 2,600 concrete poles are now installed.

Concrete Pole Features . . . A 60-kv network tower was shown in the picture of the double power line on Electrical World's cover of Aug. 31. This double pole tower can stand a maximum draft of 17,640 lb, (8,000 kg). Single poles are used as suspension poles. Double pole masts with drafts of 3,530 to 17,650 lb are used as pylons and special masts.

Both suspension masts and special mast types were built on stepped concrete foundations. Mast lengths varied from 59 to 75 ft, depending on soil conditions. Distances between conductors were always about 9 ft based on a maximum span of approximately 660 ft. Minimum distances above ground of 19 to 22 ft were maintained in accordance with regulations of the Association of German Electrotechnicians.

Essentially, the concrete pole is a round hollow mast that is fabricated with steel reinforcement. With present manufacturing equipment masts can be made up to 78 ft long in one section. Longer masts are made up from several sections.

Diameter of the mast at the top varies from 4½ to 15¾ in. (110 to 400 mm), according to stress. Single pole masts are set in the ground to a depth of 6½ to 9½ ft. Actual depth is dependent on length, maximum draft (peak load), and ground condition. Double pole masts are rigidly interlocked by concrete shoes.

How They Are Made . . . Hollow concrete masts are manufactured by a centrifugal casting procedure. Mast is formed over reinforcement of steel rounds with a tensile of at least 128,200 lb/sq in. (9,000 kg per sq cm), an elastic limit of 85,300 lb/sq in. (6,000 kg/sq cm), and a diameter of 0.315 to 1.18 in. (8 to 30 mm).

Longitudinal bars are aligned in a circle and are encircled by two opposite rotation spirals of steel wire.

The entire structure is put into a rotating form made of sheet steel with wood backing. Concrete mix is centrifugally molded against the wall of the rotating form during a 12 to 20-minute rotating period. Rotation is at 350 to 500 rpm. At this speed air and dust particles and other light materials are forced to the hollow center with the water in the mix.

Materials in the mix consist of pure clay-free pit sand and washed Danube pebbles which are added to the concrete in granulations of ⅛ to ¼ in. and ¼ to ¾ in. The result is an exceptionally high quality concrete which has a marble-like density and a surface much like glazed cement. With at least 31.2 lbs, (500 kg) of cement in each cubic foot, (cubic meter) of rotating concrete, cement for the outer finish is formed from the concrete pole mix itself.

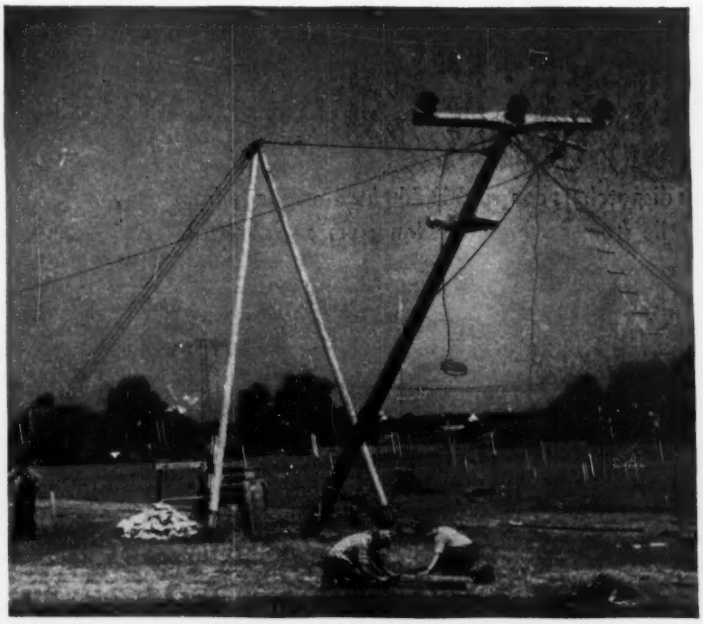
Erecting Concrete Masts . . . Concrete poles and concrete cross arms are delivered separately to the site. The masts and the crossarms are molded together on the ground. High quality cement is used, and the grout sets and is ready for use in about three days.

Suspension masts must be calculated for the wind load on the conductors as well as on the mast and masthead equipment. Pylon masts must be designed to the resulting drag of all conductors, and the crossing masts adapted for two thirds of the conductors. Additional loads, such as hoar frost need not enter into the calculations in such cases.

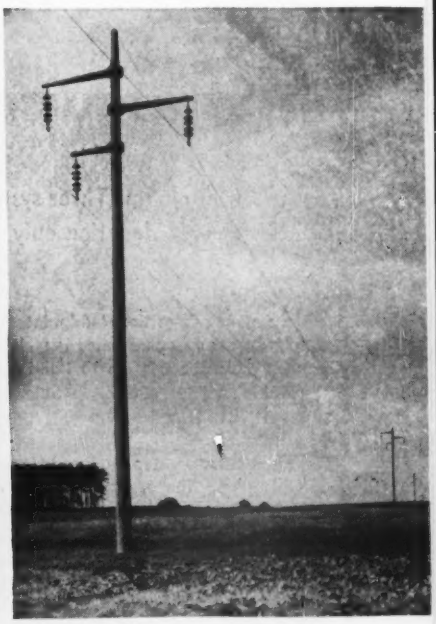
Rotated concrete masts are erected in the same manner as wood or structural steel. Lighter masts are erected with the help of V-shaped hoisting devices called swallows. Heavier masts, according to their size and weight, are erected with one or two auxilliary derricks. Tractors with built-in winches expedite the erecting job for heavy masts.

Initial costs of rotated concrete mast lines is a bit more expensive. However, no maintenance or painting is required. They do not need initial painting. Economies effected by the use of concrete poles have been proven over the long run. To date, it has not been necessary to disconnect the 20-kv concrete mast line built in 1927 between Ansbach and Feuchtwangen for repair work.

OVERSIZE GRAPNELS make it easy for German linemen to ascend the concrete poles



CONCRETE MAST for a 20-kv line, equipped with crossarms and insulators, is raised by power-driven winch. Rope ladder hanging from the crossarm will be used later by the linemen



ERECTED IN 1930, this 60-kv line from Nuernberg to Weissenburg looks almost new

SUPERVISORY CONTROL CABINETS at Hilltop dispatching center are checked by a load dispatcher. In the background to the left is the system diagram board, 40 by 12 ft, made of perforated aluminum lacquered green. In the right background are recording instruments

Penelec Consolidates Communication in Strategic New Dispatching Center

Three system dispatchers control 563,250 kw of capacity from location only a mile from company headquarters at Johnstown

C. H. CONRAD, System Operator, Pennsylvania Electric Co, Johnstown, Pa.

Advantages from the standpoint of overall system communication led Pennsylvania Electric Co to build its dispatching center at Hilltop Substation less than a mile from the company's Johnstown headquarters.

This substation steps down 115 to 23 kv, tieing the transmission system to the distribution network. Thus it provides direct carrier channels to all major stations. Hilltop was also the terminal for the company's first microwave installation and is the base station for emergency mobile radio operations.

The new dispatching center is carrier-connected to all generating station, regional dispatching offices, and points of tie-line control. Carrier is used for voice communication, telemetering, and supervisory control. Commercial telephone circuits are employed for carrier backup. Microwave is used for voice communication only between Hilltop and Seward generating station 10 miles away. Plans call for its use in pilot relaying and load control in the near future.

Telemetering Facilities . . . Frequency modulated and impulse telemetering are used to operate indicating and graphic instruments which register continuous megawatt output from all major generating stations, interconnection tie-line loadings, and system frequency.

From Roxbury Substation, metering point for the tie with Metropolitan Edison Co, telemetered in-

formation is received on megawatts and megavars, using frequency modulated carrier. Soon, remote metering will go into service to indicate hourly readings of the dial on the tie-line watthour meter. Using carrier current of the impulse type, these readings will be available by dialing over an existing telephone channel.

Over a leased telephone circuit, impulse-type telemetering using audio tones provides Hilltop with information from Warren Station concerning generation and loading of the Niagara-Mohawk tie-line. This same circuit can be used for emergency voice communication by interrupting telemetering.

Supervisory Control . . . Supervisory control embodies an all-relay system of latest design similar to that used for the automatic telephone. This extends a company policy, instituted during recent years, which specifies supervisory control for all stations where full automatic operation is impractical. This program has made it possible for fewer operators to have better control of all stations, particularly during emergencies.

At present, eight substations and one hydro generating station are operated via supervisory control from Hilltop; other substations will be converted in the near future. Deep Creek generating station, 70 miles from the dispatching center, is operated over telephone cable circuits and tone-impulse carrier systems. A 403-cycle tone is transmitted over a cable pair to Tower 51 Substation six miles distant to modulate a carrier which goes to Deep Creek where similar equipment sends return impulses.

The dispatcher at Hilltop starts and stops the two generators at Deep Creek and controls generator kilowatt and kilovar output. General alarms and breaker positions are telemetered to the dispatching center as lamp indications. Continuous readings are received in kilovars and kilowatts.

Dispatchers and load supervisors at Hilltop occupy an operations room 44 by 27 ft. It contains the system diagram board, supervisory control cabinets, metering instruments, and desk stations for two dispatchers and one load supervisor. There is plenty of space to move around in.

Curved Diagram Board . . . The system diagram board is 40 by 12 ft and extends from the floor to the ceiling. Built in the form of a semi-circle with 25-ft radius, the board consists of ⅛-in. perforated aluminum panels mounted on a steel frame. The face is finished in green lacquer. Fiber tape of various colors is used to designate lines of different voltage. Symbols, stamped from the same tape, indicate types of equipment, and paper letters are used to spell out the names of stations.

Benchboard cabinets 35-in. high, narrower in front than in back, are 3 ft in front of the system diagram board; arranged side by side, they form an arc that conforms to that of the board. All relays for 80 points of control are mounted in the cabinets beneath a sloping panel on which are the switches and pilot lights.

For compactness, small indicating instruments with 4-in. dials are installed in a console on the load supervisor's desk within easy viewing range. This arrangement keeps the operating area to a minimum and permits easy grouping of instruments for maximum visibility under routine and emergency conditions.

Recording instruments used for historical data and for analysis at Hilltop are wall-mounted on steel panels. Layout design did not require these units to be within viewing range of the load supervisor although he can see them when he desires to observe load trend.

Telephone Turrets . . . A compact 32-line cordless key cabinet is provided at each of the three dispatching positions. These units operate in multiple with respect to lines, independently as to operating positions. Key cabinets and associated relay and terminal facilities accommodate all commercial and private voice circuits, including the company's mobile radio installation.

The key cabinets provide full light and buzzer supervision of all circuits, customary hold positions, and automatic start for voice recording apparatus. One headset serves the dispatcher on all circuits. This eliminates the cluttering of the desks with separate instruments.

Hilltop dispatching center occupies a new 68 by 27-ft fireproof building of concrete, steel, and aluminum. It is air-conditioned all year by utilizing both cycles of a compressor-type system. Inside are the operations room, the communication equipment room, two office rooms, and a small kitchen. The latter contains an electric range and refrigerator for the convenience of the dispatchers, especially during emergencies when work schedules are extended. A 15-kw, 60-cycle gas-engine generator provides power for communication, telemetering, supervisory control, and emergency lighting at times when normal sources fail, as they might during severe storms.

LOAD SUPERVISORS DESK has a special console with 4-in. indicating instruments for compactness and 32-key cordless telephone turrets. The system operators office is in the rear

For low-cost generation . . .

Study Heat Cycle Arrangement

Goal should be the lowest overall cost per kwhr, not lowest Btu per kwhr or cheapest plant

D. E. HART, Engineering Dept, Detroit Edition Co, Detroit, Mich.

The basic steam cycle comprising essentially a boiler, turbine-generator, condenser, and boiler feed pump has changed very little during the last 30 years. The two most important changes involve the almost universal use of regenerative feedwater heating and, more recently, the very wide acceptance of resuperheating.

In considering possible improvements comments will be confined to the single reheat cycle and be directed particularly to:

1. Basic cycle improvement as a result of increased pressures and temperatures.

2. Improvements due to arrangement of components.

The objective is to secure, not neccessarily the lowest Btu per kwhr, nor the least expensive plant in terms of dollars per kw, but the lowest overall cost per kwhr.

Pressure-Temperature Conditions . . . Although significant improvements have been made in boiler, turbine, and auxiliary equipment efficiencies, by far the greater part of the improved efficiency currently obtained results from use of higher steam pressures and temperatures.

The theoretical straight regenerative cycle heat rate gains that may be realized at temperatures up to 1,600 F and pressures up to 3,000 psia have been presented in an ASME paper by Knowlton and Hartwell. At a turbine throttle pressure of 1,250 psig in the temperature range of 900 F to 1,300 F, it may be observed that the cycle heat rate improves at about the rate of 1.0% for each 50 F increase in the throttle temperature. Above 1,300 F, at 1,250 psig, the rate of improvement diminishes slowly until at 1,600 F, the practical cycle heat rate improvement is approximately 0.8% for each 50 F increase in throttle temperature. If it is assumed that throttle conditions of 1,450 psig, 1,000 F are representative of the modern straight regenerative plant, it may be noted that when 2,400 psig, 1,150 F is made available a total heat rate improvement of 6.1% may be possible.

It is interesting to relate the increases in pressure and temperature with corresponding developments in metallurgy of materials. Fig. 1 indicates that the average steam pressure has increased at a rate greater than 45 psi per year in the past ten years. Throttle temperature has risen at an average rate of about 12 F per year.

Although exceptional metallurgical developments have been made in the past decade, the widespread utilization of steam temperatures of 1,100 F or above will require a developmental period to establish the reliability of metals at these temperatures.

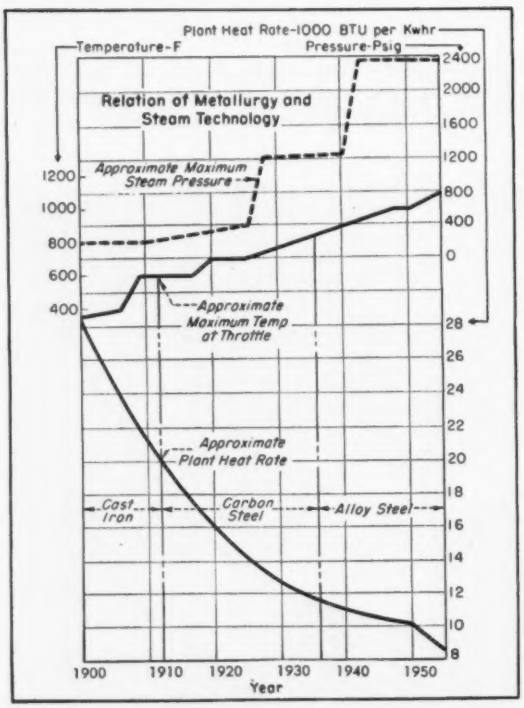


FIG 1—ALLOY STEELS in 1936 made higher steam temperatures and lowered heat rates possible. The 50-year progress of steam technology has lowered the thermal input by approximately two-thirds

Reheat Cycle . . . Trend of increasing costs has emphasized the immediate need of a cycle that will provide greater improvement in heat rate than is possible with the straight regenerative cycle and at the same time will not require use of metals at temperatures where reliability may be sacrificed. The reheat cycle meets this urgent requirement. Reheating to the initial throttle temperature results in an improvement in heat rate of about 4.5%.

Assuming again, Fig 3, that 1,450 psig, 1,000 F are typical of today's straight regenerative plant, a heat rate improvement of 7.5% over this typical cycle may be realized for the larger units with a reheat cycle operating at 1,800 psig, 1,050 F, 1,050 F. Within current metallurgical practice it is possible to achieve heat rate improvements that are greater than those possible for the straight regenerative plant only by using greatly increased pressure-temperature conditions.

However, even reheat cycle pressures and temperatures are being extended to higher levels. Units are now operating with steam conditions of 2,350 psig, 1,100 F initial temperature and 1,050 F reheat temperature. With these conditions the heat rate improvement will approximate 9.5% over the 1,450 psig, 1,000 F straight regenerative cycle. A recently announced unit with throttle conditions of 4,500 psig and 1,150 F and incorporating double reheat, first reheat to 1,050 F and second reheat to 1,000 F, should provide a heat rate improvement of approximately 16%

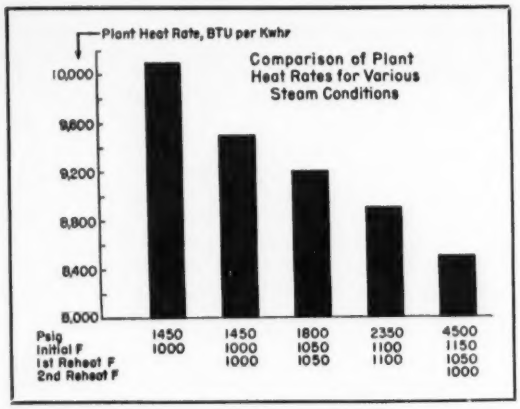


FIG 2—EACH HIGHER TEMPERATURE and additional reheat improves the plant heat rate. Comparisons for several conditions

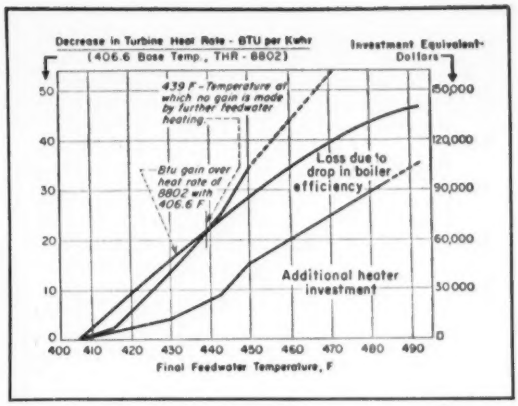


FIG 3—BREAK-EVEN POINT is at 439 F because no further economic gain is achieved by resorting to higher feedwater temperature

over the 1,450 psig, 1,000 F regenerative cycle. Conservative estimates of plant heat rate and heat rate improvement for higher steam conditions are shown in Fig. 2. Further savings which accrue to the reheat cycle are:

1. The reduction in size and cost of main condenser, feedwater heaters and steam-generator.

2. Improved low pressure blade efficiency and reduction in exhaust moisture.

Economic Comparisons . . . Determining what increase in pressure-temperature is economically justified in a new plant requires careful consideration of essentially the following items, each of which may be affected by pressure and temperature:

1. Cost of turbine-generator.
2. Cost of steam-generator.
3. Cost of feedwater cycle components.
4. Cost of condensers.
5. Cost of building as reflected by equipment size.
6. Cost of piping.

These various costs are summarized for the alternate steam conditions in a given study. The annual fuel savings resulting from the reduced heat rate brought about by higher steam conditions are expressed as a percent of the additional investment required for equipment. If this ratio, which is essentially the return on the additional investment, exceeds the normal fixed charge rate for new investment, the higher steam conditions may be economically justifiable. It remains only to evaluate intangibles such as equipment outage, probably increased maintenance, or more complex operation with the higher steam conditions, before a decision is made.

An example of this type of study is shown in Table I where steam conditions were studied for a 200-Mw unit.

Cycle Arrangement . . . In order to determine the best cycle arrangement numerous preliminary heat balances must be completed using approximate design data furnished by equipment manufacturers. The different heat balances include variations in the following more important aspects of the feedwater cycle:

1. Final feedwater temperature.
2. Number of feedwater heaters.
3. Extraction stages.
4. Subcooling and desuperheating at heaters.
5. Location of pumps.
6. Location of evaporator.

Most of the variations involve a change in equipment investment making it necessary to evaluate the change in heat rate in order to determine the economy of the variation. Economic justification is again determined by relating the coal savings to the increased investment. Of course, ease of operation and overall cycle reliability as well as economy must be considered in each case. Although most of the savings that may be realized from a study of these items are small, as may be seen from the following examples, achievement of the best overall plant heat rate is secured by exploring these relatively small gains and utilizing them to the utmost.

1. Final Feedwater Temperature . . . These remarks will be confined to the selection of an optimum final feedwater temperature for a unit with throttle conditions of 1,300 psig, 950 F. However, the principles used are of such a nature that the procedure is applicable to most studies. The theoretical optimum feedwater temperature is about 485 F for these throttle conditions Table II. The practical gain in turbine-cycle gross heat rate requires the calculation of several heat balances. This tabulation is indicative of heat rate improvement with increasing final feedwater temperature.

There are two conditions which offset the apparent economic gain indicated by increasing final feedwater temperature. First, heater costs increase, and, second, there is a possible loss in boiler efficiency and an increase in boiler cost with increasing economizer water-inlet temperatures. It is necessary then to secure approximate feedwater heater and boiler prices and to determine the trend in boiler efficiency with economizer water-inlet temperatures.

Increased investment in heaters, equivalent increased investment because of possible boiler efficiency loss may be plotted against equivalent reduced investment from heat rate savings for higher feedwater temperatures, and a break-even point determined. Fig. 3 indicates that for this study the break-even point is at 439 F. It was decided to design for a final feedwater temperature of 430 F at 10% overload which would give about 425 F at rated load.

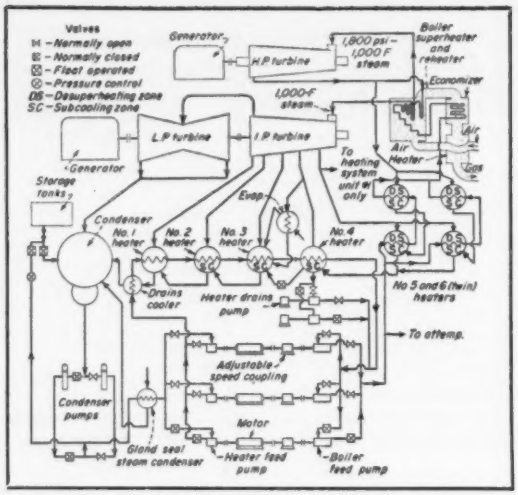


FIG 4—FLOW DIAGRAM FOR 125-MW UNIT at St. Clair power plant registers the economic decisions made regarding number and location of thermal accessories. Steam-sealing lines for both turbines are omitted as are by-pass lines or other piping details

2. Number of Feedwater Heaters . . . To illustrate possible alternate arrangements of cycle components, the flow diagram for the St. Clair plant is shown in Fig 4. Once the final feedwater temperature has been determined in the manner described above, there remains the determination of the proper number of heaters to be employed in the total feedwater temperature rise.

However, it is wise to determine for a particular cycle just how many heaters are practical as well as economical. For example, with a final feedwater temperature of 450 F at 5/4 load for the St. Clair plant cycle, the study data in Table III were prepared.

The estimated cost of the seventh heater, installed, was approximately $30,000. From the tabulation it can be seen that the heat rate savings would pay for the seventh heater. However, the shell pressure of the heater adjacent to the condenser was only 2.5 psia with 5/4 load on the turbine. Although some plants are in operation with heater pressures no higher than this, it was felt that the shell pressure in this heater might become critical from the standpoint of cascading drains to the condenser at lower loads. As a result six stages of feed heating were used which, in view of extractions stage selections, doubled the shell pressure in the lowest heater.

3. Extraction Stage Pressures . . . Once the number of stages of feedwater heating and the final feedwater temperature are determined, the turbine manufacturer will indicate alternate stages which may be selected at the general pressure level of each stage of heating. To determine the optimum combination of extraction stages, heat balances must be calculated for as many combinations as seem practical.

For example, the data in Table IV shows how to determine the extraction stages for a six-heater cycle. The arrangements are a few of those considered and it is evident that Arrangement C should be selected, other things being equal. As the pressure changes but little at the extraction points for the various arrangements, it is not expected that extraction piping costs or total cost for the six feedwater heaters would vary by any appreciable amount. The decision is then one of selecting the arrangement with the optimum heat rate.

Very recently the American Gas & Electric Corp announced (EW, June 29, p 72) that a double reheat unit will be installed. In addition, the plant will incorporate other unique steam cycle improvements, such as a supercritical throttle pressure and 1,150 F initial throttle temperature. The first reheat to 1,050 F will occur at 1,150 psig and the second reheat to 1,000 F will occur at 165 psig. This plant will have a heat rate of approximately 8,500 Btu/kwhr and represents an improvement of about 4.5% over a single reheat cycle operating at 2,350 psi, 1,000 F, 1,050 F reheat.

It has been suggested that liquid metals might be used to convey heat from the boiler to the turbine. This would simplify the steam piping tremendously in a double reheat arrangement since the reheaters probably would be located at the turbine. This also suggests the possibility of three or more stages of reheat. A preliminary investigation indicates that the maximum thermodynamic gain which might be achieved with multiple stages of reheat over the single reheat is of the order of 5 to 6%.

If fixed charges, fuel costs, and operating expenses continue to rise at the present rate, double or even multiple reheat may become economically advantageous.

4. Sub-cooling and Desuperheating . . . Again the optimum size of desuperheating zones and sub-cooling sections in the various heaters is primarily determined by a series of heat balances. It is practical to arrange all sub-cooling sections integral with the heaters except the lowest heater which has an external drains cooler. Subcooling in the heaters serves to reduce the amount of flash steam in the drains from each heater, thus reducing the erosion that has been experienced in the past both in drain lines and the heaters themselves.

On the lowest heater it is advantageous to cool the drains as much as practicable so that a minimum of heat is lost to the condenser. To secure a 10 F approach for the lowest heater it is necessary to use a large external cooler. A 10 F approach temperature is used on all heaters in recent cycles with the exception of the heater from which the heater drains pump takes suction. In this case, the sub-cooling section is provided primarily to secure satisfactory suction conditions for the heater drains pump.

To determine the optimum terminal temperature differences at each of the heaters, several heat balances are calculated using the stage pressures previously established. Table V indicates the variation of heat rate with changing terminal temperature conditions.

Arrangement D was chosen although it did not represent the minimum heat rate. The cost of the larger desuperheating zones in the intermediate pressure heaters were such that the selection of Arrangement C could not be justified.

5. Location of Pumps . . . Possible flashing at the boiler-feed pump suction and corrosion-erosion problems at high temperatures led to the investigation of the merits of arrangements which place heaters on the discharge of the boiler feed pump to reduce the pump suction temperature. Actually the location of the boiler feed pump has little, if any, effect on the heat rate as long

as all other factors are held constant. Attention must then be directed to equipment cost as compared to boiler feed pump suction conditions. Table VI is indicative of information compiled to make a decision on boiler feed pump location.

In this study, location of two heaters on the discharge of the boiler-feed pump was decided upon to keep the suction temperature low and to maintain a high ratio of suction pressure to flashing pressure. Selection of Arrangement C furnished insurance against flashing but cost $45,600 more than Arrangement A would have cost if the final feed temperatures were the same. Again, this was considered justifiable from an operating standpoint.

A heater-drains pump inproves the economy of a cycle compared to full cascading operation. In a particular study for the Trenton Channel plant extension it was found that by the judicious location of a heater drains pump, the cycle heat rate could be improved by about 12 Btu per kwhr. Furthermore, the total cost for the five heaters was $17,000 less for the heater drains pump cycle. The heat rate saving as equivalent investment and the saving in heater cost were sufficient to provide for the investment in the heater drains pump installation. The operating advantages of the full-cascading cycle were not deemed sufficient to offset such a saving and consequently the heater-drains pump was used.

6. Location of Evaporator . . . Changing the location of the evaporator has only a slight effect on the heat rate, and consequently such questions as investment and possible air in-leakage become the determining factors. In a cycle where all deaeration is accomplished in the condenser, it is desirable to have the makeup pass back to the condenser for deaeration before entering the feedwater circuit to avoid undue corrosion in the feedwater circuit. Consequently, the evaporator must be placed below the heater drains pump in the feedwater cycle.

Although there may be several extraction stages below the heater drains pump, it seems desirable to place the evaporator at a point such that evaporator shell pressure does not drop below atmospheric pressure even at low loads. This precaution will minimize air in-leakage and in turn reduce the deaeration load in the condenser.

Introduction of the evaporator into the steam cycle results in an overall increase in heat rate in the order of 30 to 40 Btu. This obviously provides the incentive for producing the make-up water in some way which does not reduce the heat cycle efficiency, such as by demineralization or by compression distillation. Improvements in the demineralizing process so as to give satisfactory removal of silica in the effluent would seem to augur favorably for this method as the heat rate savings would seem adequate to offset the additional cost.

Table I—Comparison of Various Steam Conditions for a Cross-Compound Double Flow-Turbine-Generator of 200-Mw Gross Capability

Steam Conditions Psig	Initial Temp	Reheat Temp	Invest-ment* per Kw of Capability	Annual Coal Cost per kw of Capability	% Return on Investment Referred to 1,800 psig, 1,000F, /1,000 F
1,800	1,000	1,000	$50.588	$13.651	100
1,800	1,050	1,000	$51.530	$13.553	110.4
2,000	1,000	1,000	$51.743	$13.533	110.2
2,000	1,050	1,050	$53.164	$13.354	111 5

* Represents only items which vary between turbine-generator units

Table II—Heat Rate Gains with Higher Feedwater Temperatures

Final Feedwater Temp, F	Turbine Gross Heat Rate, Btu/kwhr*	In Heat Rate, Btu	Gain Equivalent Investment Justified by Coal Savings
406.6	8,802	Base	Base
430.0	8,786	16	$48,000
450.2	8,773	29	$87,000
485**	8,757	45	$135,000

* Based on a five-heater cycle ** Optimum theoretical feedwater temperature

Table III—Heat Rate Gain with Seven Heaters vs Six Heaters

Number of Heaters	Turbine Gross Heat Rate, Btu/kwhr	In Heat Rate, Btu	Gain Equivalent Investment Justified by Coal Savings
6	7,821	Base	Base
7	7,808	13	$36,000

Table IV—Determination of Extraction Stages

Arrangement Designation	Extraction Stage Combination	Turbine Gross Heat Rate, Btu/kwhr	Gain in Heat Rate, Btu
A	18, 16, 13, 10, 5 & cross-over	7,820	Base
B	19, 17, 14, 10, 5 & cross-over	7,805	15
C	19, 16, 13, 9, 4 & cross-over	7,800	20

Table V—Effect of Heater Terminal Temperature Differences

Arrangement Designation	Terminal Temperature Difference Combination, deg F	Turbine Gross Heat Rate, Btu/kwhr	Gain in Heat Rate Btu
A	5, 5, 3, 3, 0, 0*	7,674	Base
B	5, 5, 5, 3, 3, −3	7,672	2
C	5, 5, 0, 0, −3, −3	7,665	9
D	5, 5, 3, 3, −3, −3	7,669	5

* Figures correspond to the terminal temperature differences at the various heaters, the highest pressure heater being represented by the figure at the right

Table VI—Boiler Feed Pump Suction Conditions

	Arrangement A	B	C
Boiler feed suction temperature, F.....	402.0	355.4	299.7
Boiler feed suction pressure, psia.....	450	460	470
Suction pressure corresponding to b-f pump suction temperature (flashing pressure), psia.....	253.1	144.5	66.7
Ratio of normal suction pressure to pressure at which flashing could occur...	1.8	3.2	6.9
Additional investment with Plan A assumed as base.....	Base	$23,400	$45,600

AG&E announces it will . . .

Promote Resistance Heating Also

Taking another look at residential load, AG&E decides to encourage resistance heating as well as heat pump house heating for full realization of all-electric home

E. A. SNYDER, Manager, Sales Division, American Gas & Electric Service Corp, New York, N. Y.

About 10 years ago, when the American Gas & Electric System was starting to look forward to a postwar period and to make plans for developing and meeting its expected loads, we began considering the possibilities of a fully electrified home. Before World War II, we thought of such a home as one in which the customer used an electric refrigerator, an electric range, and an electric water heater, with, of course, lighting and miscellaneous small appliances.

However, it became evident about 10 years ago that the domestic market was broader than this and that competition was going to become keener. We found that, if gas companies sold service for house heating, they were in a very strong position to persuade customers to install gas water heating, cooking, and other appliances. So to meet this competition effectively, we would have to find a way to heat houses electrically with economy to both our customers and ourselves.

Heat Pump Experience . . . American Gas & Electric Co had many years of experience with the heat pump because of numerous installations in company buildings. Accordingly, at the end of World War II, we embarked on a program with other utility companies and with manufacturers to develop the heat pump as a package unit to provide residential customers with all-year air conditioning. Meanwhile, we made many more installations in company buildings and sold heat pumps to many customers, both commercial and residential.

While this program did not develop rapidly, it now is really beginning to take hold. At least two leading electrical equipment manufacturers are actively marketing package units. One of these already has cut their price.

Took Another Look . . . As we made our plans to set up sales organizations and programs for promoting the heat pump more actively, we took another look at the entire residential field. It is our conclusion that this field is still broader than we had thought 10 years before.

About 1 million homes are being built each year. About 30,000 are in our territory. The last 10 years have seen tremendous growth in air conditioning and a considerable growth in resistance heating. So, in order to obtain our proper share of the residential market and bring the goal of the truly all-electric home into actuality, we have embarked on a stepped-up program embracing not only the heat pump, but also residential air conditioning and resistance heating.

Training and Education . . . Each of the AG&E companies is training sales personnel to carry on the promotional, engineering, and educational phases of electric heating and cooling. This program will include assisting distributors of equipment to find dealer outlets. The sales organizations of system companies will cooperate with the dealers in developing prospects and assisting in design and service.

Sales personnel also will work with architects and builders to acquaint them fully with the availability, advantages, and performance of this equipment. We are carrying on customer educational meetings, displaying equipment, and otherwise assisting in promotional activities.

As we have for many years, we believe that the heat pump provides the most satisfactory method of heating and cooling and that the heat pump will find its greatest application in homes where complete year-round air conditioning is desired. While the market probably is greatest in new houses, the heat pump also has application in existing houses with good insulation, and suitable ducts.

Cost Consideration . . . Contrasted with this, resistance-type heating, whether by radiant panels, built-in ceiling heat, or other types of heaters, is expected to have its greatest use in houses where first cost is of prime consideration and where the customer is interested principally in heating rather than year-round aid conditioning for the entire house.

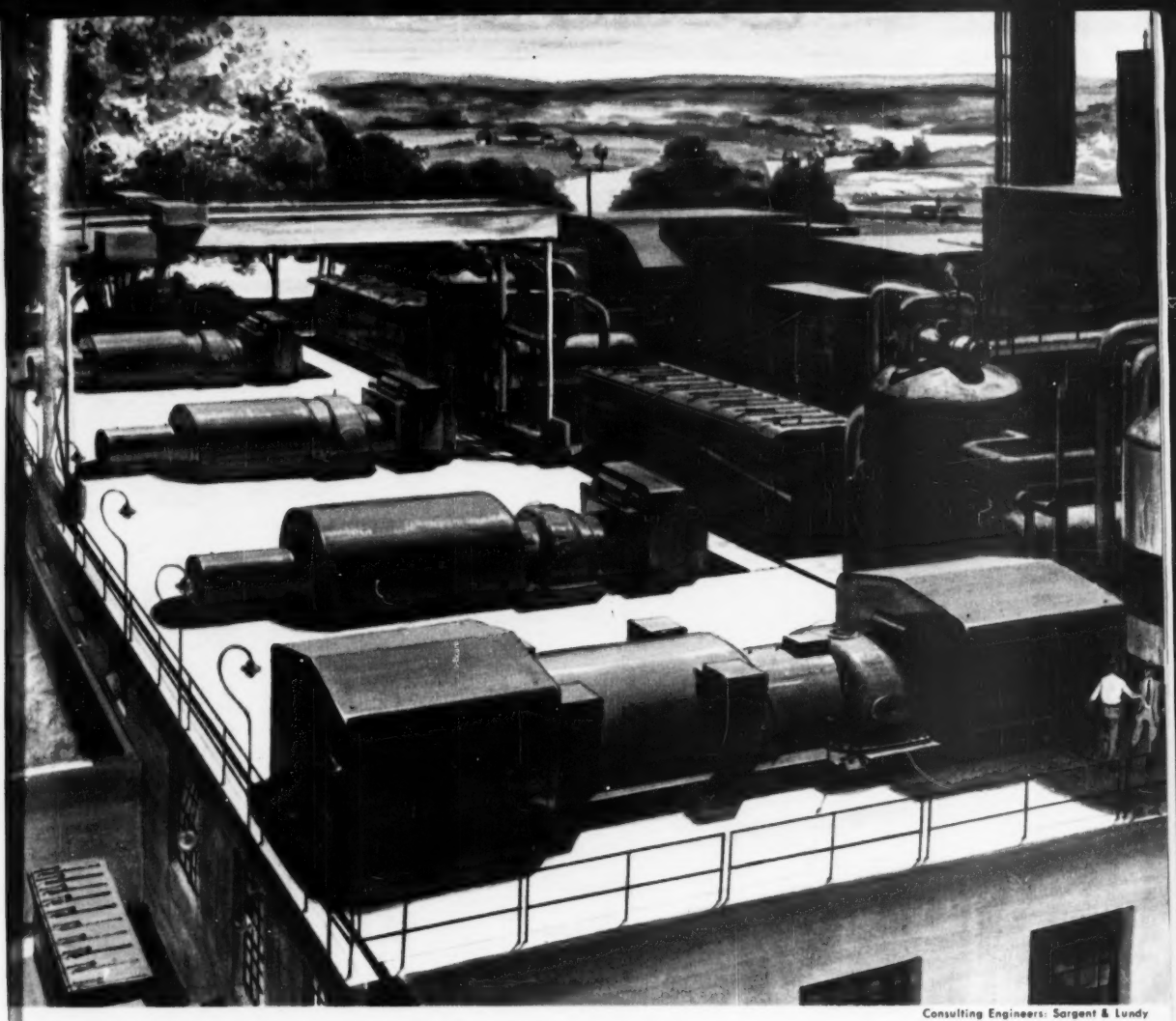
It is believed that the market for resistance-type heating will be confined for the most part to new homes which are designed for this equipment. There is, however, a considerable market in existing homes for use of resistance heaters as auxiliaries, for hard-to-heat rooms, bathrooms, etc.

Contrasted to heat pumps and resistance heating, air conditioning units can be installed in existing as well as new houses so that the market here is extremely broad. The market for room conditioners quite definitely includes the small homes heated by resistance units in many areas.

Balanced Promotion . . . We believe therefore that, by promoting these three pieces of equipment, we can achieve a good balance between heating and cooling loads. This, in turn, will result in higher overall load factors for the residential class and lower overall cost of service than would result if we promoted only one.

Further, we think that in a system as widespread as ours—which sells only electric service in Virginia, West Virginia, Kentucky, Tennessee, Ohio, Indiana, and Michigan, there is unquestionably greater diversity than would be found in a single limited area. Our system is in two time zones and in several temperature zones.

We are promoting these same pieces of equipment for commercial and industrial as well as for residential users for much the same reasons. The entire promotion is being undertaken on the basis of existing rates of the several companies within the system.



Consulting Engineers: Sargent & Lundy

At Central Louisiana's Pioneering Coughlin Generating Station

ADAPTABILITY OF G-E TURBINES FOR OUTDOOR USE HELPS UTILITY REDUCE CAPITAL COSTS PER KW

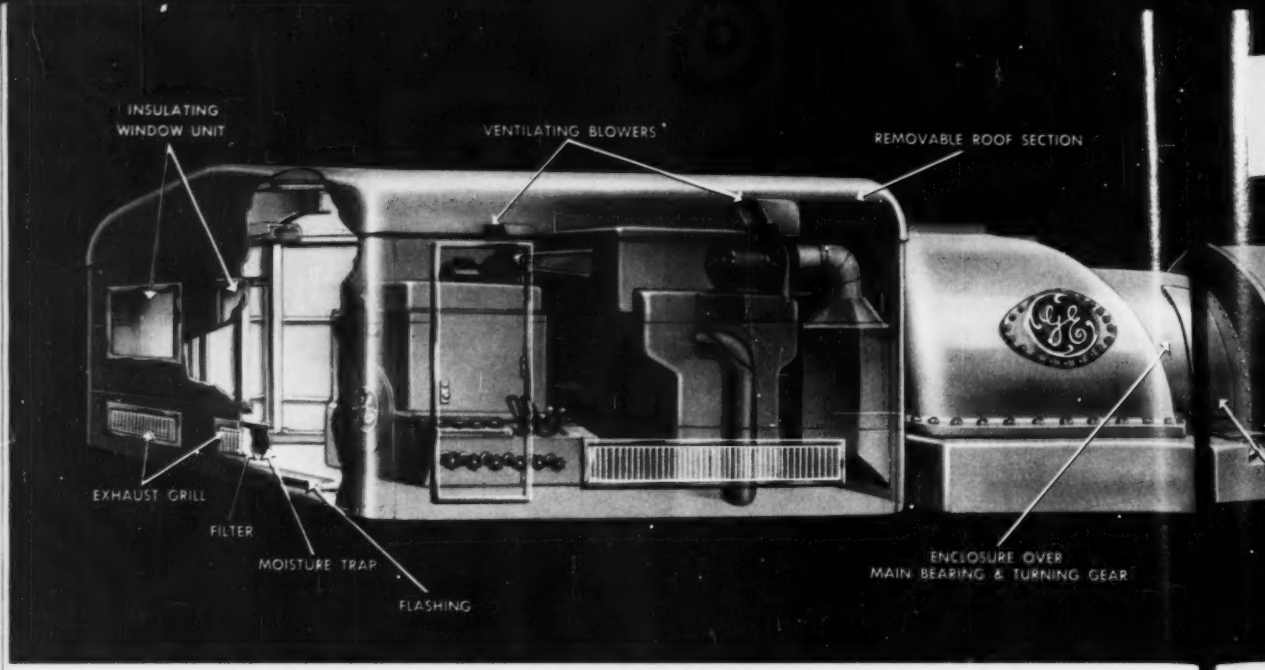
When it expanded its electrical facilities in 1948, the Central Louisiana Electric Company decided to take advantage of the fact that an outdoor station was practical in their locality and would reduce capital investment costs. Because General Electric turbine-generators were suitable for outdoor use, two units were installed in Central Louisiana's Coughlin Generating Station.

These early G-E units featured weatherproofed housing over both the front standard and exciter. Switchgear, boilers, and much auxiliary equipment were also set in the open, to make this one of the first outdoor stations. The successful operation and maintenance of these initial units led to the installation of two more outdoor G-E turbine-generators, to raise station capacity to 55,000 kilowatts.

The latest G-E unit (foreground of picture) features walk-in housing over both the front standard and exciter, providing good protection against the elements, and easy accessibility for routine maintenance of valve gears, control mechanism, and the exciter.

GENERAL ELECTRIC

FOR DETAILS TURN TO FOLLOWING PAGES



G-E Outdoor Turbine-Generators Meet Varied Customer Requirements

Housings Simplify Servicing of Controls and Exciter

Because outdoor station requirements vary greatly, depending on local conditions and specifications, G.E. has developed several types of units over the past few years. Two types are illustrated on these two pages: (1) Walk-in enclosure over both front standard and exciter; (2) Weatherproofed front standard and walk-in housing over the exciter. Here are their important features:

GOOD LIGHTING AND VENTILATION MAKE MAINTENANCE EASY

To simplify the task of operating and maintaining outdoor turbine-generators under difficult conditions, careful attention has been given to the ventilation and lighting of all types of housings and to turning gear enclosures, which are quickly accessible for all routine maintenance.

The walk-in type of housing features air pressure above atmosphere, with filters at both intake and exhaust openings to minimize entrance of moisture, dirt, sand, rain, etc. Provisions for heating can be made when the local conditions require. Double lighting circuits are provided, for normal as well as emergency lighting.

ATTENTION TO DETAIL PROTECTS OUTDOOR UNITS, SIMPLIFIES HANDLING OF HOUSINGS

In the lagging for a G-E outdoor steam turbine, the number of joints which have to be broken for maintenance purposes has been kept to a minimum and all other joints are seal-welded. All bolted joints are carefully gasketed. Gaskets and a specially designed overlapping flashing, supplied by G.E., are used to seal the turbine-generator at the foundation.

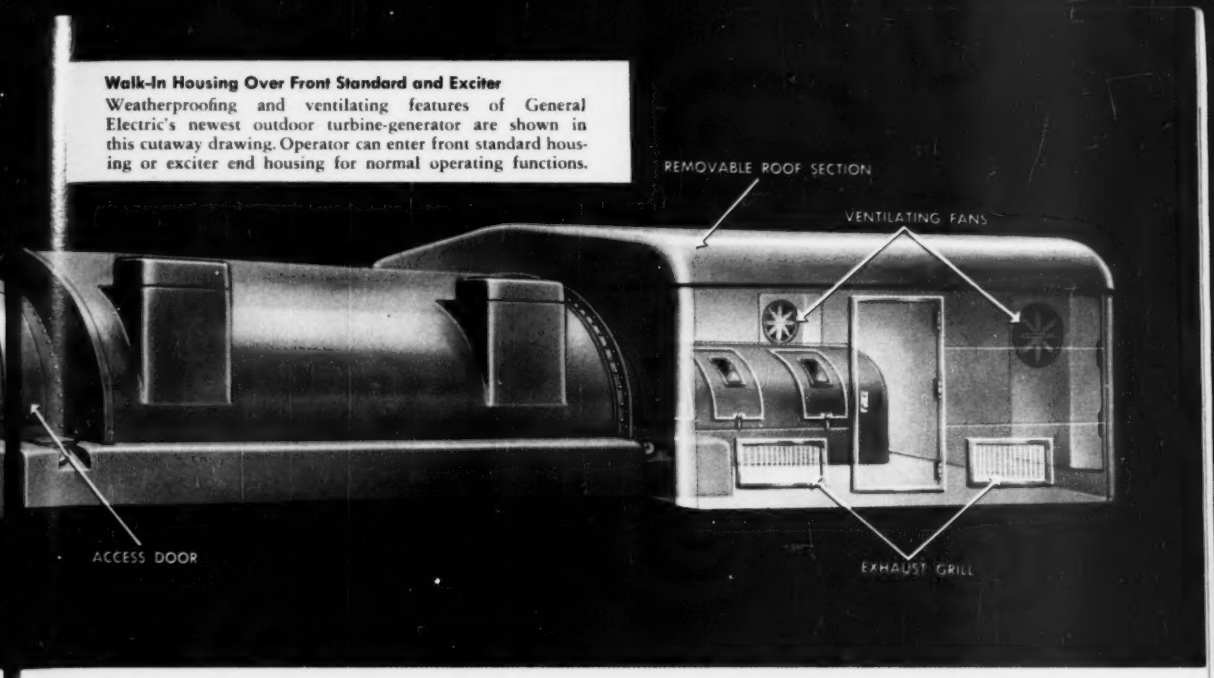
Component sections for the various housings are fabricated in sizes that are easy to handle and ship. After reaching location, the housings are readily assembled into a strong, rigid structure. The walk-in housing provides sufficient space for normal operating functions.

By constantly anticipating new problems in turbine-generator design, G-E engineers have provided units capable of turning in high efficiency records for both outdoor and indoor installations. Experience gained in building more than 40 outdoor units has enabled G.E. to meet any special weatherproofing or servicing requirements. General Electric Company, Schenectady 5, N. Y.

Leader in Turbine-Generator Progress

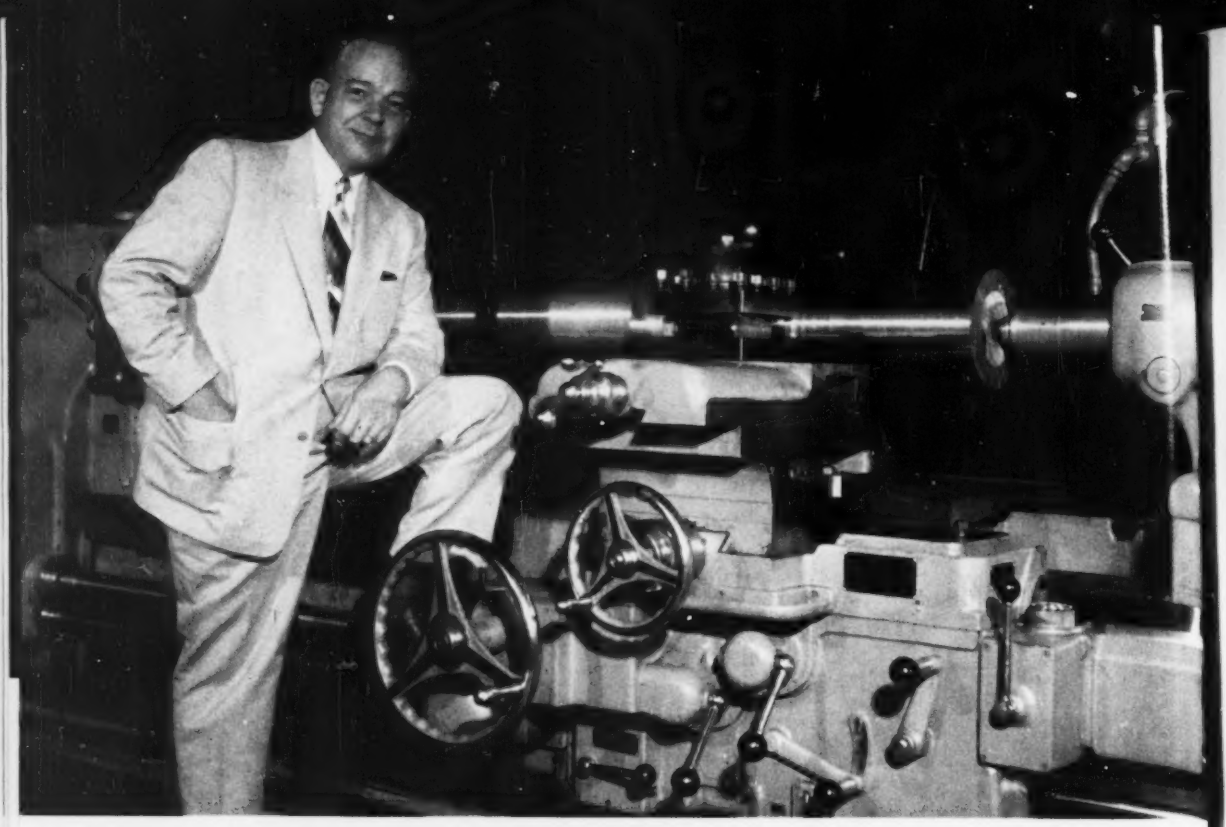
GENERAL ELECTRIC

Walk-In Housing Over Front Standard and Exciter
Weatherproofing and ventilating features of General Electric's newest outdoor turbine-generator are shown in this cutaway drawing. Operator can enter front standard housing or exciter end housing for normal operating functions.



M. M. Patterson, Manager of Sales, left, C. E. Evans, Turbine Engineer, and L. M. Domeratzky, Generator Engineer of the Medium Steam Turbine, Generator and Gear Department inspect a unit with weatherproofed front standard and walk-in housing over exciter.

Sniffer test (above) is performed on welded and bolted joints of all G-E turbine-generators to assure absolutely tight seal against hydrogen leakage. Freon gas is used in this test with G-E Type H Leak Detector.



G-E engineers are ready to design outdoor turbine-generators for any location . . .

L. D. Whitescarver, G.E.'s Manager of Marketing, Medium Steam Turbines, answers some questions

Q. Where does G.E. stand in regard to special design requirements for outdoor stations?

A. General Electric has installed turbine-generator sets outdoors in widely separated areas with varying climatic conditions. For instance, we installed one outdoor unit in an area that was subject to heavy sandstorms; another installation was right on the coast, where salt water corrosion was the major problem; a third outdoor unit was designed to operate at an ambient temperature as low as —40°F. The different kinds of housings we have available give us the flexibility we need to meet such varying customer demands.

Q. Have the operating records of already-installed outdoor units been satisfactory?

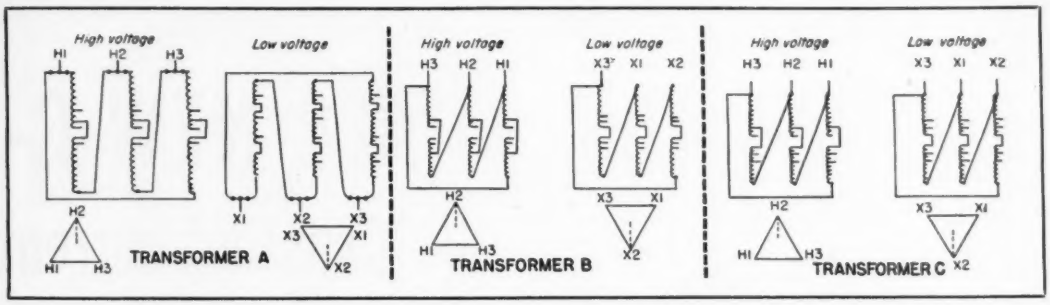
A. We're sure of it. Each of the rather unique installations which I've just described worked out very well. Central Louisiana Electric Company's Coughlin Station is another good example. This utility came back for more shortly after their first outdoor turbines went on the line — now have a total of four in operation.

Q. What do you believe will be the future of outdoor turbines?

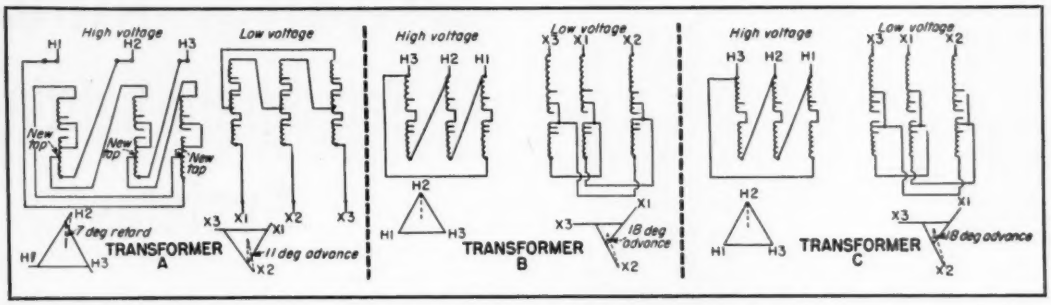
A. General Electric believes that the decision as to the kind of station which should be built in a particular locality is entirely the province of the electric utility and its consulting engineers. Therefore, we have no forecast on the number of outdoor stations which will be built, although we presume that outdoor stations will have a part in the nation's over-all power expansion program. On any new station our objective is to have the most advanced designs available to meet whatever arrangement will best provide low-cost electric power generation. 254-9

Progress is our most important product

GENERAL ELECTRIC



Original delta-delta transformer connections for providing power flow reversal were reworked to . . .



Reconnected extended delta, which provides 18-deg fixed phase-angle advance that was desired

Reconnected Transformers Reverse Power

System loading conditions on two parallel transmission circuits of the Boston Edison Co necessitated provision for power reversal on a section of one circuit. Use of phase-angle regulating transformers was the obvious solution, but higher cost and long delivery conditions led to a satisfactory solution by reconnecting in extended delta three already installed transformers. This yielded a fixed phase-angle advance. Future plans for system development did away with the ultimate need for power flow reversal. Transformer capacity was adequate in the section requiring power reversal.

BENJAMIN ALBERT, Electrical Production Engineer, Boston Edison Co

Total transformer capacity involved was 25.5 Mva, with a voltage rating of 69 to 24 kv. At peak conditions a power reversal of about 15 Mva was required. This was obtainable with an 18-deg phase advance on the low-voltage side of the transformers. Studies showed that about 60 kv would be available on the high side under power reversal. Hence a 60 to 24-kv transformation was needed.

Three 3-phase transformers were concerned in the reconnection project. Transformer A (see table) was oil and fan-cooled. B and C were oil and water-cooled. All were initially connected delta-delta with 180-deg phase displacement between high and low-voltage windings.

As the extended delta connections would result in unbalanced winding turns, reduced capacity, and increase of impedance, the proposed reconnections were discussed with the transformer manufacturers, who gave their approval and changed the ratings of the transformers as shown in the table.

Transformer A (Allis Chalmers) required reconnection of both 69 and 24-kv windings in extended delta. A new tap was needed at the 13.5% point on the 69-kv windings to provide a 7-deg phase retard. On the

(*Continued on page* 108)

Transformer Data Before and After Reconnection

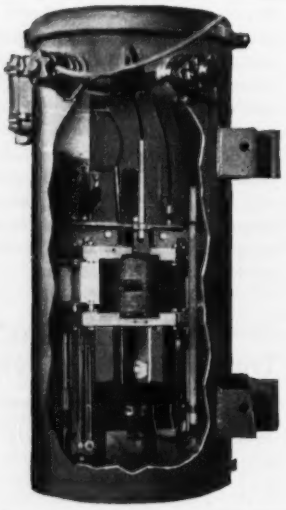
Transformer	Delta-Delta Connection: Kva	Voltage Rating	Impedance	Extended Delta Connection: Kva	Voltage Rating	Impedance
A.....	6,750/9,000	69,000/24,200	9.6%	3,900/5,200	59,000/24,400	15.5%
B.....	5,000/7,500	69,000/22,000	10.8%	2,900/4,350	59,000/24,110	14.5%
C.....	6,000/9,000	69,000/24,200	10.4%	3,767/5,650	59,000/24,110	14.5%
Total...	17,750/25,500			10,567/15,200		

Quality lighting at less cost with G-E engineered equipment.

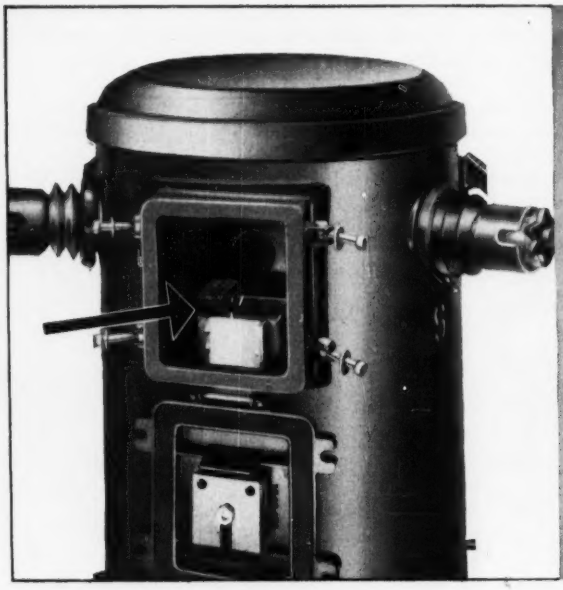
ALL NEW G-E Constant-current TRANSFORMER for Street-lighting Systems

up to 33% lighter

NEW lighter weight means easier handling. RO2 transformer, including oil, is 20% and 33% lighter in the 10-kw and 30-kw sizes respectively.



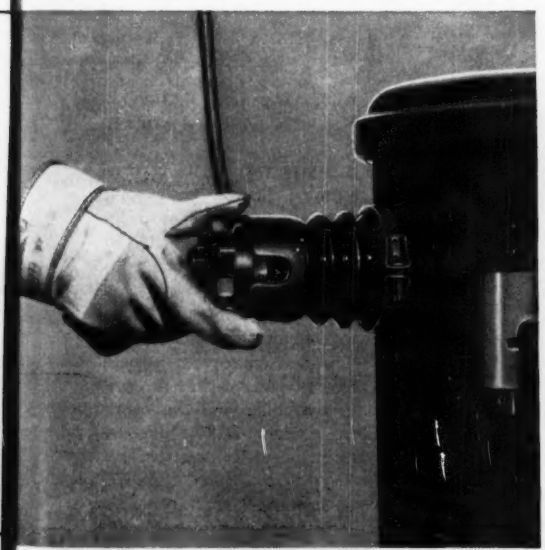
NEW faster response to load changes from radically new design which eliminates counter balance, introduces parallel straight-line motion, cuts down friction points.



NEW easy adjustment is accomplished from the outside through convenient access door located above the oil level. Transformer cover need not be removed.

NEW easy mounting cuts installation time. Special slotted mounting bracket allows direct-pole mounting of models up to and including the 20-kw size.

. . and far easier to install and maintain



NEW simplified connections, quickly, without tools, by inserting the cable from either direction into the bushings and tightening the insulated handwheel.

G.E.'s new CC transformer for street lighting represents the most sweeping design advance in the industry in 50 years.

LESS FRICTION—It uses the magnetic suspension principle to completely support its moving coil. Thus, the only points of friction in the entire assembly are the two sleeve ball bearings which direct vertical movement of the moving coil.

LIGHTER WEIGHT—The new CC transformer is lighter and more compact, permitting pole mounting of larger ratings than was possible before. Grain oriented silicon strip steel in the core and aluminum wire in the moving coil conserve space and weight.

GREATER CONVENIENCE—Easy installation and servicing are assured by the simple mounting bracket, the cable bushings with their insulated handwheels. The access door on the side of the tank permits adjustments without removing the cover and reaching below the oil level.

VERSATILE—Designed to supply constant current for series street-lighting circuits, this new G-E CC transformer will operate efficiently with any type of lamp load.

MORE INFORMATION—Is available from your nearest G-E Apparatus Sales Office or authorized G-E street-lighting agent. Or write for Bulletin GEA-5975, Section 452-137, General Electric Company, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

Power Reversal

(*Continued from page* 105)

24-kv windings an 11-deg phase advance resulted by using the existing tap connections at the 27.3% point of the total winding to form an extended delta connection. Net phase advance was 18 deg. Fortunately the tap locations on the 69-kv windings were accessible on the outside surface of the coil stacks.

Existing low-voltage taps on Transformers B and C (General Electric) at 50% and 54.6%, respectively, of the total winding were utilized to form the extended delta connection. By making the proper selections of high and low-voltage tap changers, the required phase advance and voltage transformation were obtained.

The increase in transformer impedance proved to be no problem and the total reduced capacity is of the order of reversed power flow desired.

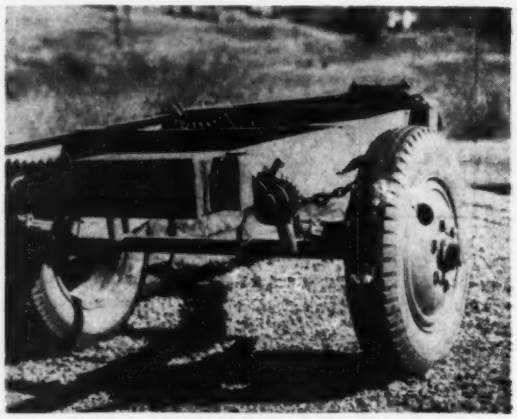
In each case it was necessary to untank core and windings to make new connections and install new terminal boards. This was done by representatives of the manufacturers. With new boards the transformers can be connected either delta-delta or extended delta by simply changing terminal straps. In future it will not be necessary to untank core and windings. Reconnections were completed in a few months at a cost of but a fraction of the major project of installing phase-angle transformers.

Safety Cradles Added to a Pole Trailer

J. M. DALTON, Line Foreman, Appalachian Electric Power Co, Fieldale, Va.

Installation of toothed-plates and a ratchet winch afford safer transportation of poles on a trailer. These modifications were relatively inexpensive. Plates were made from scrap material and the ratchet winch cost approximately $15. Labor for cutting plates and welding them to the trailer was furnished by the line crew during inclement weather, which prevented normal work.

To grip the lead pole and hold it in place, thereby preventing the poles sliding forward on a sudden stop, three steel plate cradles with blunt teeth were used. Each cradle was formed from a 6x14x0.5-in. plate and welded on the trailer as illustrated. Teeth points are filed down as a safety precaution and also to prevent their piercing the pole and opening cracks that would allow decay fungus to enter untreated areas.



BLUNT-TOOTHED CRADLES and ratchet winch with chain prevent sliding of poles when trailer stops quickly

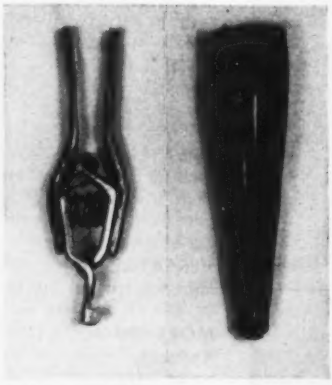
In addition, a small hand-operated ratchet-winch was welded to the trailer frame to serve as a permanent device for chaining poles to the trailer.

Quick-Connection Terminals Aid A-Base Meter Testing

H. D. RIPPL, Working Foreman, Mobile Meter Testing Laboratory, Ohio Power Co, Canton, Ohio

Quick-connection terminals made by Ohio Power Co save considerable set-up time in testing A-base meters with female pin-type terminals. High contact pressure and capacity, low voltage drop, and wide applicability are other advantages.

Testing terminal was made from a standard 20-amp spring-type test clip and two 3-in. pieces of No. 8 hard-drawn copper wire soldered to each jaw. Adjacent sides of both wires were ground so that when pressed together they jointly approximate one No. 6 wire. The clip portion is normally covered with a rubber sleeve.

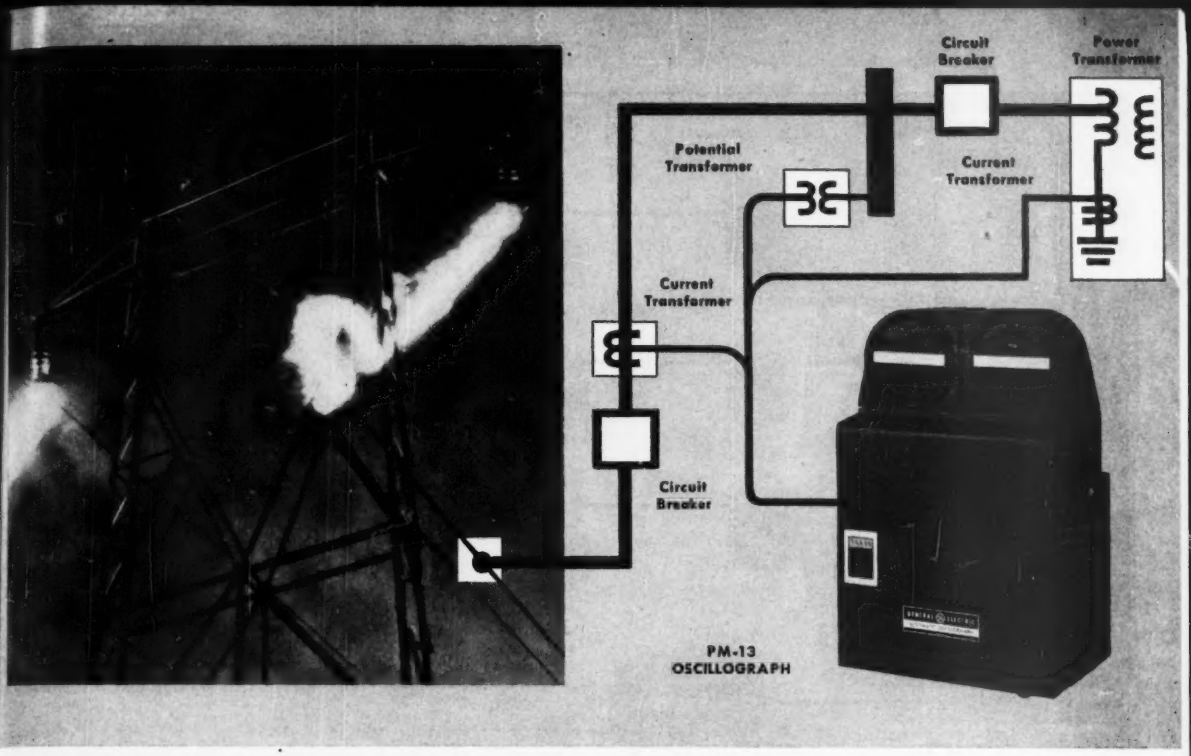


SPRING CONTROLS contact pressure of sleeve-protected terminal

Terminals give two points of contact in terminal sleeves, each point exerting pressure in excess of 3 lb. This assures high current capacity (50 amp) and minimum voltage drop without tightening terminal screws.

Terminals are applicable to all sizes and spacings of meter-terminal chambers now used. Even with A-base meters having current-coil or coil connectors extending into the meter terminal but not electrically connected to the terminal sleeves, direct contact is assured.

Cost of terminals for test boards was negligible because they were made by employees when weather would not permit changing meters.



TRANSMISSION-LINE FAULT (ACTUAL PHOTO) CAUSED BY LIGHTNING IS AUTOMATICALLY RECORDED BY GENERAL ELECTRIC OSCILLOGRAPH

G-E Automatic Recording Oscillograph Quickly Pinpoints Flashover Faults

Faster and more economical location of system faults can be accomplished by use of the new General Electric PM-13 automatic oscillograph. Patrol crews can go directly to the fault and make a thorough examination of the damaged area in less time than it previously took to make a superficial examination of the entire line. Damaged equipment not visible from ground patrols can be detected and replaced before additional trouble occurs by a thorough check of a short length of line.

FAST ACTING

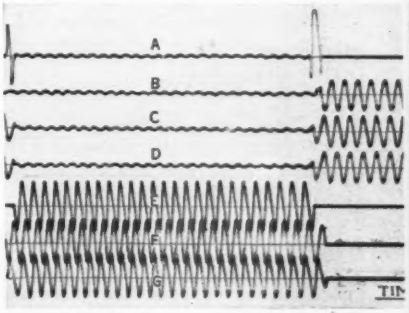
A flashover occurs! One-quarter cycle (1/240 of a second) later the oscillograph starts full-speed recording and continues for the duration of the disturbance. The record can be removed and the distance to the fault can be determined in 5 to 10 minutes. The oscillogram from this instrument also gives a complete record of what happened during and immediately following the system disturbance. Relay and circuit breaker operation, fault duration, magnitude of short circuit currents and other needed information is quickly available to permit a thorough analysis of system performance during the fault.

NEW FEATURES

The new PM-13 now includes 7 galvanometers, a new no-adjustment light source, simplified paper holders and unit sub-assembly construction. Fussy adjustments have been eliminated. A new time recorder photographically records the time and date on the face of the oscillogram as well as the company name or station, if desired.

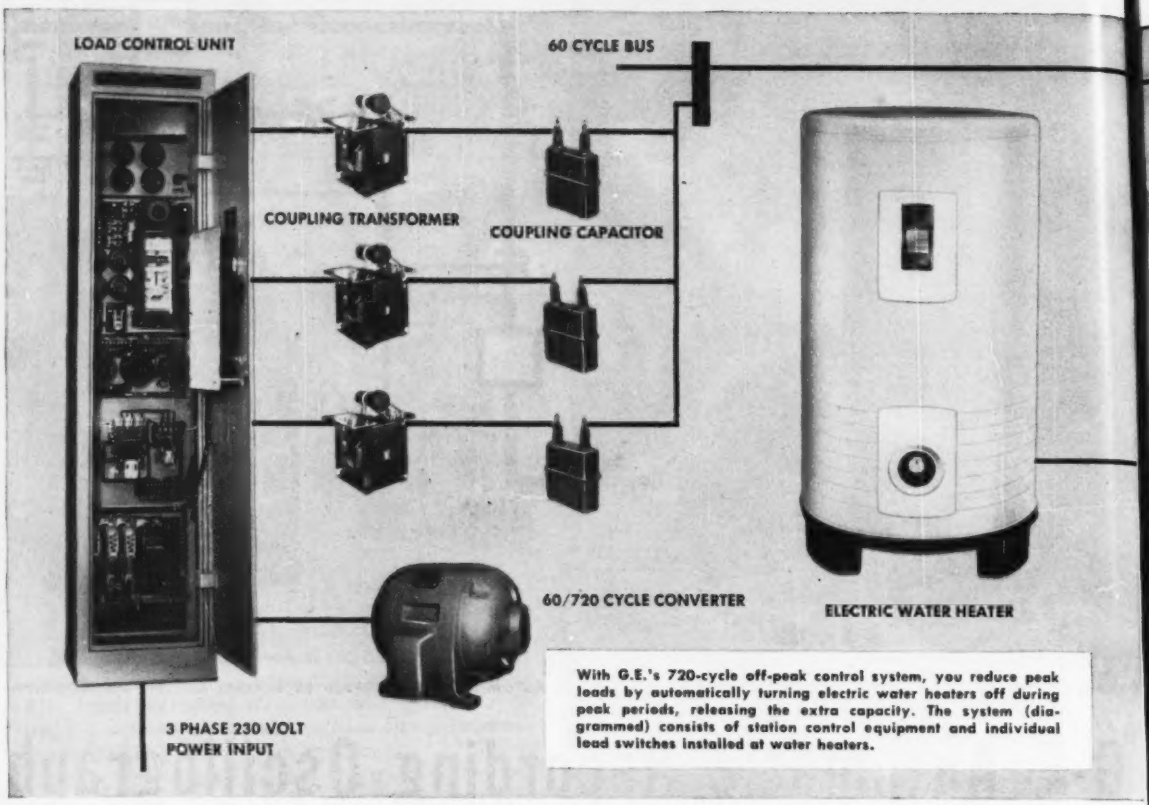
FURTHER INFORMATION

Contact your local G-E Apparatus representative, or write for Bulletin GEC-396 to: Section 605-59, General Electric, Schenectady 5, N. Y.



OSCILLOGRAM SHOWS WAVE FORMS of ground current, line current, and phase/phase voltages resulting from lightning fault.

GENERAL ELECTRIC



With G.E.'s 720-cycle off-peak control system, you reduce peak loads by automatically turning electric water heaters off during peak periods, releasing the extra capacity. The system (diagrammed) consists of station control equipment and individual load switches installed at water heaters.

You receive these off-peak control benefits and . . .

Solve Your Peak Load Problems with G-E

You can solve growing peak load problems with off-peak control of the electric water heaters on your system. By cutting the heaters off during the peak period, you reduce the demand load and gain these benefits:

RELEASED SYSTEM CAPACITY

If you multiply the number of electric water heaters on your system by 0.6 (the average KW demand per heater), the result is the capacity which can be released into your system by off-peak control.

LOWER INVESTMENT COSTS

Installed new capacity, per 0.6 KW, costs approximately $300. Off-peak control eliminates the need for new capacity and costs you only $25–$50 per heater.

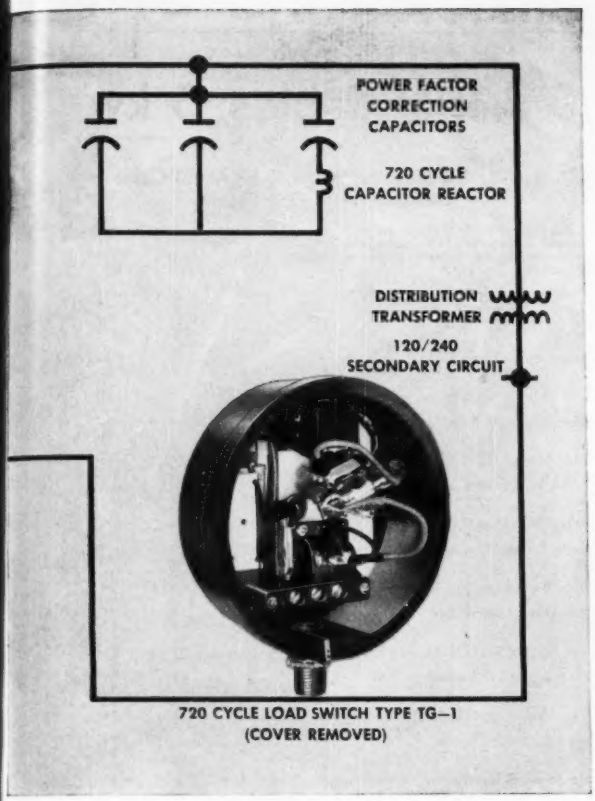
INCREASED SYSTEM LOAD FACTOR

If a substation serves 10,000 water heaters with an average load of 50,000 KW and a peak load of 90,000 KW (without control), the load factor—ratio of average load to peak load—is 56%. If the heaters are controlled the peak load is reduced by $10{,}000 \times 0.6$ per heater, or 6000 KW. Demand is lowered to 84,000 KW. Load factor is 60%—a 7.1% improvement in system efficiency.

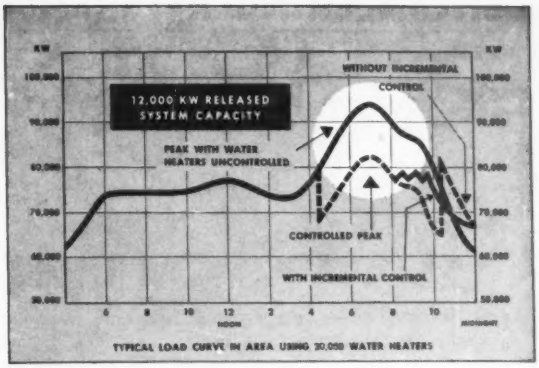
720-CYCLE OFF-PEAK CONTROL

A 720-cycle off-peak control system will help you realize these benefits. The system consists of centrally located

GENERAL ELECTRIC

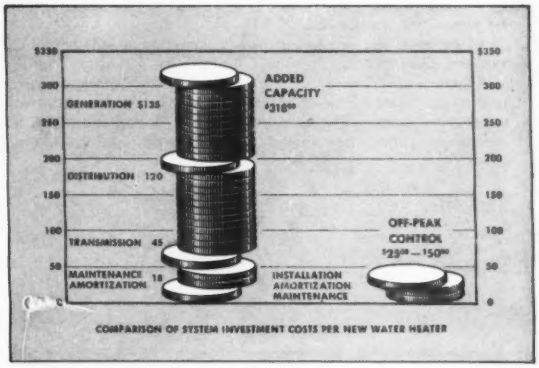


720 CYCLE LOAD SWITCH TYPE TG—1
(COVER REMOVED)



TYPICAL LOAD CURVE IN AREA USING 30,000 WATER HEATERS

RELEASED SYSTEM CAPACITY. A 720-cycle system will release enough extra capacity to considerably reduce peak loads. A new incremental feature now reconnects the heaters without causing secondary peaks.



COMPARISON OF SYSTEM INVESTMENT COSTS PER NEW WATER HEATER

LOWER INVESTMENT COSTS. Where pronounced peak loads occur it is unnecessary to install new capacity (costs approximately $300 per 0.6 KW). Off-peak control costs only $25–$50 per heater.

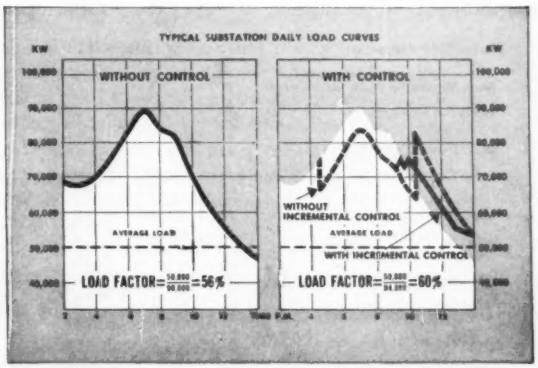
720-cycle Control

station control equipment and individual load switches installed at the water heaters. During the peak period, the switches automatically disconnect the heaters from the system. After the peak has passed, they automatically reconnect the heaters to the system.

NEW INCREMENTAL FEATURE

When the water heaters are reconnected to the system, the thermostats will usually call for more heat. On a system with a high water-heater saturation, this may frequently cause a secondary peak load. The automatic 720-cycle control includes a new incremental pickup feature which eliminates this problem. The new feature reconnects the heaters to the system in groups without causing any secondary peaks.

FOR MORE INFORMATION. Call your G-E Apparatus Sales Office, where a representative will be glad to discuss off-peak control in terms of your system. Or write for Bulletin GEA-5819 and GEC-931 to General Electric Company, Schenectady 5, New York. 605-62



INCREASED SYSTEM LOAD FACTOR. With 720-cycle off-peak control more KW hours can be sold without exceeding a given peak demand; the return on system investment is greatly increased.

Sags for No. 6, 3 and 1/0 Aerial Cables, 5 kv

FRED SCIOTTI, Overhead Distribution Engineer, Narragansett Electric Co, Providence, Rhode Island

Notes

Ruling Span = Average span + ⅔ (Maximum span − Average span)

Individual spans in excess of 125% of the ruling span should be separately deadended.

In general, secondary wire in the same span will be sagged not less than the aerial cable.

Sags are based on an effort to combine optimum appearance and a maximum factor of safety with sufficient clearance from other conductors in the same span. Under loaded conditions the messenger will not be stressed in excess of 60% of its ultimate strength.

Sag for 2-Conductor, No. 6, 5-kv Aerial Cable (Messenger and One Phase)

Cable Data: Weight = 0.622 lb per ft Support is ⅜-in. 40% H.S. Copperweld messenger having ultimate strength = 10,460 lb	Temp., deg F	Ruling Span, ft 75 to 115	 116 to 160	 161 to 200
Maximum Tension (½ in. ice, 4 lb wind), lb	0	1980	2450	3615
Stringing Tension for all spans, lb	30	1000	1240	1710
	60	780	1035	1450
	90	630	880	1245
Inches Sag for 50-ft span	30	2	....	....
	60	3	....	....
	90	4	....	....
Max. Vertical Sag (½ in. ice, no wind)	32	4	....	....
Inches Sag for 75 ft span	30	5	4	....
	60	7	5	....
	90	8	6	....
Max. Vertical Sag (½ in. ice, no wind)	32	10	7	....
Inches Sag for 100 ft. span	30	9	8	....
	60	12	9	....
	90	15	10	....
Max. Vertical Sag (½ in. ice, no wind)	32	17	12	....
Inches Sag for 125 ft. span	30	15	12	9
	60	19	14	10
	90	23	17	12
Max. Vertical Sag (½ in. ice, no wind)	32	27	19	14
Inches Sag for 150 ft. span	30	....	17	12
	60	....	20	15
	90	....	24	17
Max. Vertical Sag (½ in. ice, no wind)	32	....	27	21
Inches Sag for 175 ft. span	30	....	23	19
	60	....	27	20
	90	....	33	23
Max. Vertical Sag (½ in. ice, no wind)	32	....	37	28
Inches Sag for 200 ft. span	30	....	....	22
	60	....	....	26
	90	....	....	30
Max. Vertical Sag (½ in. ice, no wind)	32	....	....	37

Sag for 4-Conductor, No. 3, 5-kv Aerial Cable (Messenger and Three Phases)

Cable Data: Weight = 1.55 lb per ft Support is ⅜-in. 40% H.S. Copperweld messenger having ultimate strength = 10,460 lb	Temp., deg F	Ruling Span, ft 75 to 115	 116 to 160	 161 t 200o
Max. Tension (½ in. ice, 4 lb wind), lb	0	2980	3680	4555
Stringing Tension for all spans, lb	30	1850	2210	2895
	60	1600	2000	2620
	90	1395	1815	2350
Inches Sag for 50 ft span	30	3	....	....
	60	4	....	....
	90	5	....	....
Max. Vertical Sag (½-in. ice, no wind)	32	5	....	....
Inches Sag for 75 ft span	30	8	6	....
	60	9	7	....
	90	10	8	....
Max. Vertical Sag (½-in. ice, no wind)	32	11	8	....
Inches Sag for 100 ft span	30	13	11	....
	60	15	12	....
	90	17	14	....
Max. Vertical Sag (½-in. ice, no wind)	32	19	15	....
Inches Sag for 125 ft span	30	21	17	13
	60	24	18	14
	90	27	21	16
Max. Vertical Sag (½-in. ice, no wind)	32	30	23	18
Inches Sag for 150 span	30	....	24	18
	60	....	26	20
	90	....	30	23
Max. Vertical Sag (½-in. ice, no wind)	32	....	33	26
Inches Sag for 175 ft span	30	....	33	25
	60	....	36	27
	90	....	41	31
Max. Vertical Sag (½-in. ice, no wind)	32	....	45	36
Inches Sag for 200 ft span	30	....	....	32
	60	....	....	35
	90	....	....	40
Max. Vertical Sag (½-in. ice, no wind)	32	....	....	47

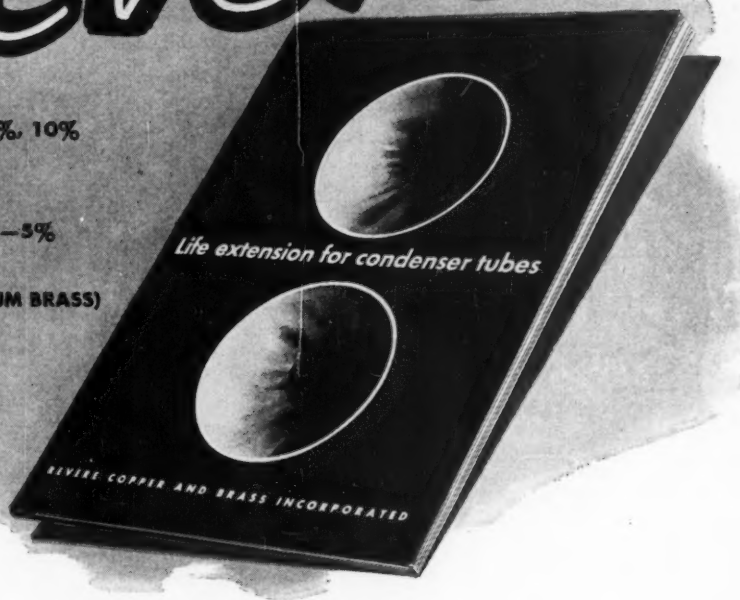
Sag for 4-Conductor, No. 1/0, 5-kv Aerial Cable (Messenger and Three Phases)

Cable Data: Weight = 2.63 lb per ft Support is ⅜-in. 40% H.S. Copperweld messenger having ultimate strength = 10,460 lb	Temp., deg. F	Ruling Span, ft 75 to 115	 116 to 160	 161 to 200
Max. tension (½-in. ice, 4 lb wind), lb	0	3920	4330	5050
Stringing Tension for all spans, lb	30	2920	3035	3480
	60	2620	2815	3280
	90	2370	2630	3110
Inches Sag for 50 ft span	30	3	....	....
	60	4	....	....
	90	5	....	....
Max. Vertical Sag (½-in. ice, no wind)	32	5	....	....
Inches Sag for 75 ft span	30	8	7	....
	60	9	8	....
	90	10	9	....
Max. Vertical Sag (½-in. ice, no wind)	32	10	9	....
Inches Sag for 100 ft span	30	13	12	....
	60	15	14	....
	90	17	15	....
Max. Vertical Sag (½-in. ice, no wind)	32	19	16	....
Inches Sag for 125 ft span	30	20	20	18
	60	24	22	19
	90	27	24	20
Max. Vertical Sag (½-in. ice, no wind)	32	29	26	22
Inches Sag for 150 ft span	30	....	29	26
	60	....	32	27
	90	....	34	29
Max. Vertical Sag (½-in. ice, no wind)	32	....	37	32
Inches Sag for 175 ft span	30	....	40	35
	60	....	44	37
	90	....	47	39
Max. Vertical Sag (½-in. ice, no wind)	32	....	50	44
Inches Sag for 200 ft span	30	....	....	45
	60	....	....	48
	90	....	....	51
Max. Vertical Sag (½-in. ice, no wind)	32	....	....	57

FOR CONDENSER AND HEAT EXCHANGER TUBES AND PLATES SPECIFY

Revere

CUPRO-NICKEL—30%, 10%
ADMIRALTY METAL
ARSENICAL COPPER
ALUMINUM BRONZE—5%
MUNTZ METAL
REVALON (ALUMINUM BRASS)



• Correct selection is essential if tubes and plates are to serve with the maximum economy and minimum trouble. The Revere Technical Advisory Service and Revere Research Department are always ready to collaborate with equipment manufacturers and operators in specification matters. • When it is time to re-tube, remember that conditions may have changed since the original installation, and that it may be wise to re-check before ordering new tubes. • To take advantage of Revere's knowledge of copper and copper alloy tubes for all industrial purposes, get in touch with the nearest Sales Office. See your telephone book or write direct. Send for helpful booklet, "Life Extension for Condenser Tubes." Free.

REVERE

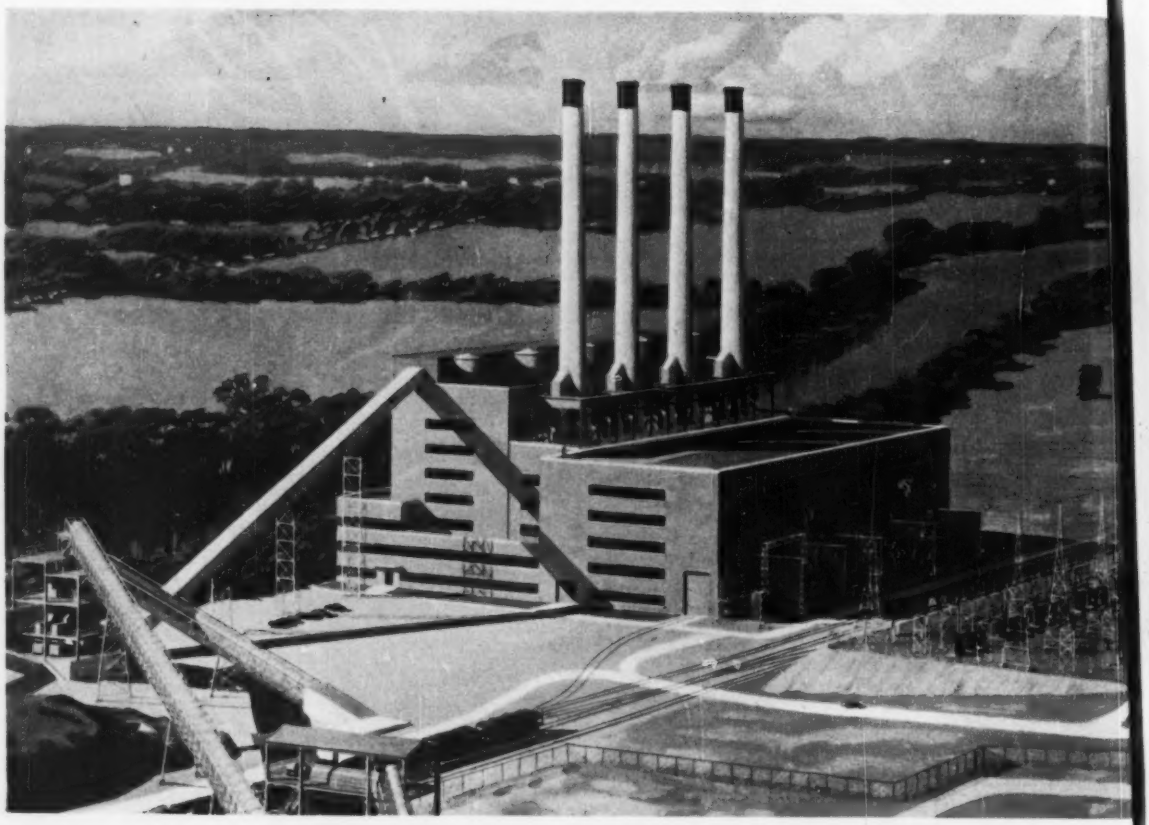
COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities. Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

New Wabash River Station of Public Will Boost System's



NEW WABASH RIVER STATION, West Terre Haute, Ind., of the Public Service Company of Indiana, Inc., designed by Sargent & Lundy, Inc., consulting engineers, will have four Foster Wheeler reheat-type steam generators with the following capacity:

Maximum continuous capacity

- Primary steam flow.....700,000 lb per hr
- Reheat steam flow.....624,000 lb per hr

Operating pressure

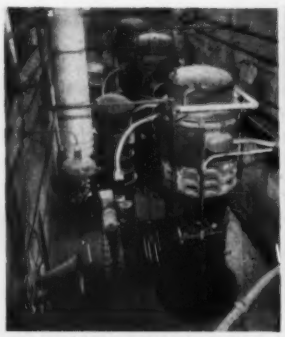
- Superheater outlet .....1500 psig
- Reheater outlet ..... 401 psig

Final steam temperature.....1005 F

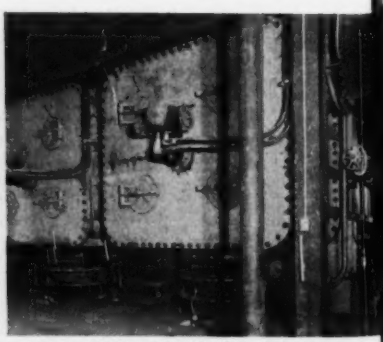
Final reheat temperature.....1005 F

Feed water temperature..... 451 F

Coal pulverized by Foster Wheeler ball mills, two for each steam generator.



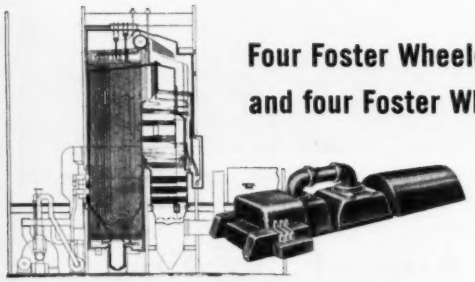
Foster Wheeler vertical circulating pumps, two of which provide a total of 62,000 gallons per minute of cooling water to each condenser.



One of four "double-flow" Foster Wheeler condensers, of the 70,000 sq ft rectangular, two-pass design.

Service Company of Indiana, Inc.
Output Capability to 940,000 kw

...*with four reheat cycle steam generators!*



Four Foster Wheeler 700,000 lb/hr reheat steam generators and four Foster Wheeler 70,000 sq ft "double-flow" condensers will serve turbines each with a gross generator output of 100,000 kw.

Designed to operate on the reheat cycle, the four Foster Wheeler steam generators at the new Wabash River Station of the Public Service Company of Indiana, Inc. will have an aggregate capacity of 2,800,000 lb steam per hr.

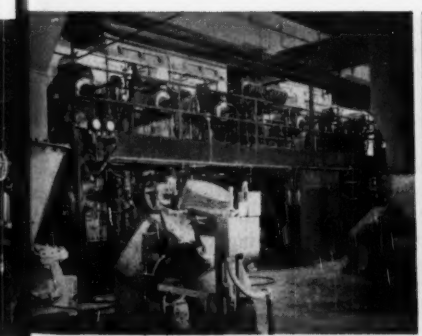
The use of combination radiant and convection superheaters makes possible precision control of final steam temperature over a wide load range. Since superheating is done partly in the radiant section, the gas temperature leaving the furnace can be sufficiently reduced so that, even with the Indiana coal used, complete freedom from furnace slagging is assured.

An all-convection reheater is located deep in the low-gas-temperature zone beyond the convection superheater section. Here safe metal temperatures are maintained during starting, shutting down and under emergency operating conditions. Reheater final steam temperature is controlled by regulation of by-pass dampers located at the economizer outlet.

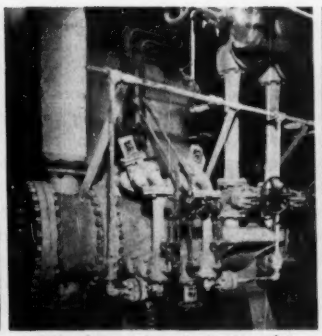
Outstanding features of the "double flow" type condenser are its inherent deaerating action and its complete utilization of available headroom. Also incorporated is a special provision for reversing the circulating water flow, thereby providing a desired cleaning action of condenser tubes.

FOSTER WHEELER CORPORATION, 165 Broadway, New York 6, N. Y.

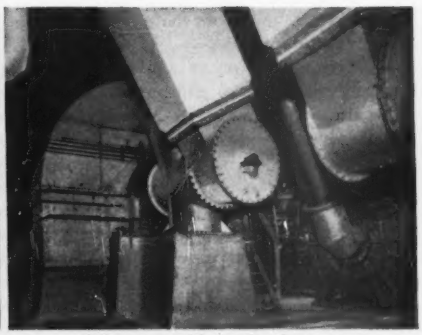
FOSTER WHEELER



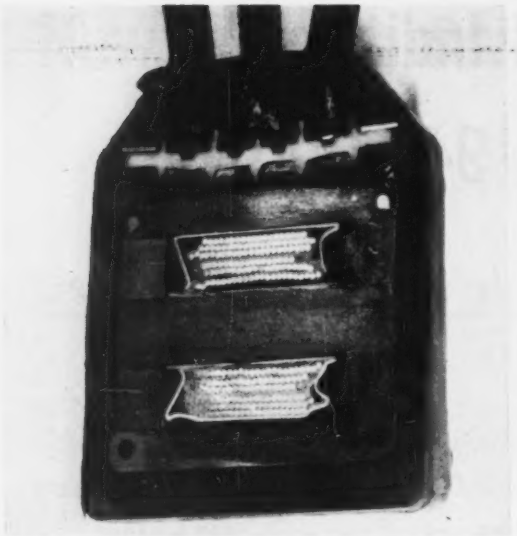
Firing aisle of one of the reheat boilers shortly after initial start-up.



Twin-element two-stage steam-jet air-ejector, with combined surface inter- and after-condensers, maintains vacuum in each 70,000 sq ft condenser.



Exhausters and ball mill pulverizers located on basement level.



SECTIONAL VIEW showing rubber filling interstices within windings

DIRECT BURIAL 30/45w transformer supplies airport taxiway light

Molded Transformers Aid Airport Lighting

Unexpected benefits for utilities may come from efforts to develop transformer equipment for combat theatre use. The successful molding of transformers in rubber may be one of the major developments of recent years.

Rubber-cased transformer assemblies have proven reliable in direct burial installations beside Air Force runways. Evidence of their dependability was recorded in the service records of over 100,000 transformers of this construction. Civil Aeronautics Administration has now standardized on similar transformers for civilian airports.

The new development by A'G'A Division of Elastic Stop Nut Corp of America turned the tide for direct burial of transformers at a time when the Air Force was seriously considering dropping the use of isolating transformers on its series underground circuits for airport lighting. As the operator of the largest group of airports in history, it had encountered a large number of failures in conventionally constructed individual lamp transformers. It was ready to expose the circuits above ground at each runway marker light.

But extended use of underground cables with polychloroprene sheaths and molded-on plug-in connectors had already indicated the feasibility of direct burial installation. As a producer of these molded-connector cable assemblies, A'G'A submitted to the Air Force transformer assemblies molded into rubber casings as a solution.

Wright Air Development Center had its labs check over samples of these rubber-covered transformers with primary and secondary leads molded into the casings. Tests for watertightness, low insulation leakage, and low operating temperature gave such satisfactory results that field tests were recommended and Air Force acceptance followed.

Savings of over $6 million in direct procurement costs were effected in five years of Air Force use of rubber-covered transformers. Installation cost is also less, even under varying local conditions. For a permanent installation, the transformer may be buried directly in the ground beside a concrete pad containing a conduit elbow. Or it may be placed on top of the ground beside a lighting cone. It is equivalent to a "bump" in the cable and is as watertight and long lasting as the cable itself.

The new transformer replaces conventional transformers which require enclosure in a compound-filled steel case and have connectors of a type originally designed for street lighting transformers. Burial of this older transformer requires a heavy, expensive cast iron box set in concrete pavement or pad which also doubles as the base upon which the runway light is mounted.

For the Air Force, keeping moisture out of coils and connectors of the conventional transformers required a quality of installation and maintenance that was not available under wartime conditions, even at permanent bases.

Qualification Tests Stringent . . . Suitability of rubber covered transformers and connectors for direct burial is ensured by severe testing at A'G'A. In one 20-cycle test, each cycle consists of operating the series transformer with secondary open circuited for not less than six hours in air, then soaking the transformer and connectors in water overnight. At the beginning and end of each soaking period, a 15,000-v insulation resistance test is performed.

Key to survival of these tests is the transformer's construction. Proper compounds and curing cycles assure watertightness by securing the bond between the case and the jackets of the leads. The coil-core assembly is securely anchored during molding to provide uniform wall thickness. In the completed transformer, satisfactory transfer of heat from interior to exterior is made possible by the elimination of internal voids and by close adherence of the case to the coil-core assembly.

YOU CAN FIND THE LINE POST YOU WANT AMONG O-B'S 108 DIFFERENT STYLES!

Only from O-B can you make such a selection of line posts -- application voltage range from 13.2-kv to severe 69-kv service -- in the range from 23-kv upward, a free choice of Tie-top or the modern O-B Clamptop head; the latter in three size ranges of clamps up to 1.5-inch cable -- short or long studs for steel or wood mounting, or no stud if desired -- 108 possible varieties of O-B line posts.

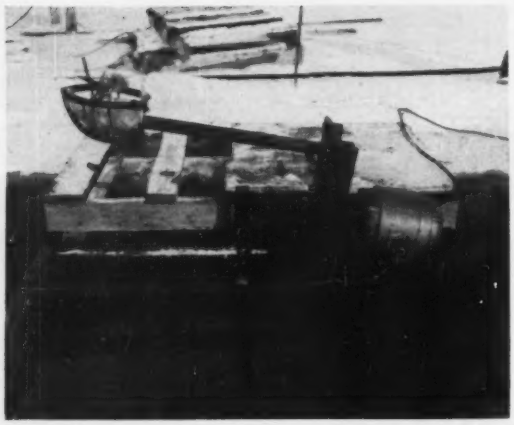
Added to the excellent insulating qualities of the O-B post, you have the satisfaction of getting exactly what you want because of O-B's extensive listing.

For your next line post requirement, let the advantage of complete selection be another reason for specifying O-B.

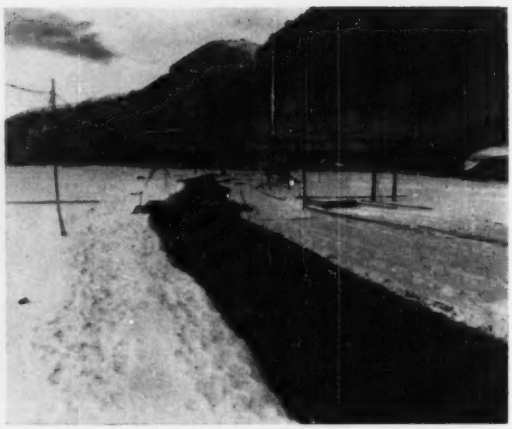
Ohio Brass

MANSFIELD OHIO, U.S.A.

4388-H



SLUSH PLOW consists of electrically-driven propeller mounted on angle iron frame spanning open cut in ice. Platform is for operator



SLUSH ICE is detoured through channel by three "plows". Instead of piling against headgate, ice is diverted downstream through log-way

"Slush Plows" Prevent Ice-Blocked Channel

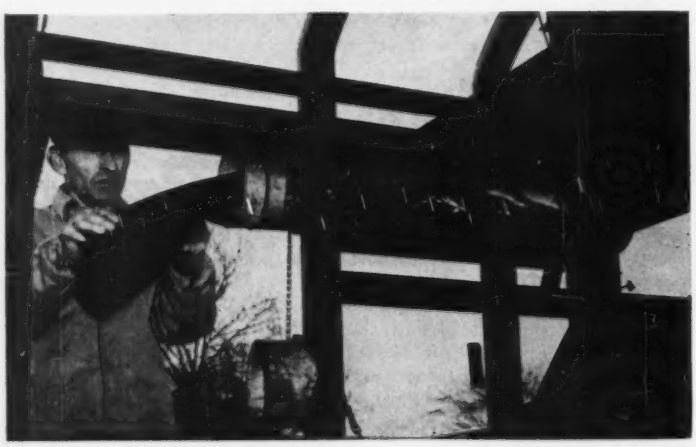
Annual savings up to $19,000 resulted from the use of "slush plows" to keep the headgate of Pilot Butte power plant free of slush ice during winter. Maintenance of an open channel allows maximum use of water in generating needed hydropower and also eliminates flooding of nearby ranch land.

During the winter slush ice forms in swift-flowing reaches of the Wind River and is carried downstream beneath solid ice to Wind River Diversion Dam. Slush piles up against the dam's canal gates that channel water into the 9-mi. Wyoming Canal feeding Pilot Butte turbines.

To solve this problem, large electrically-driven outboard motors were slung on angle iron frames which spanned an open cut in the ice paralleling the canal headgate. Propellers stir up slush ice and keep it moving down river through a log-way, thereby diverting it from the headgate. Only regular gate tender and one extra employee are now needed to keep the channel open, except during emergency conditions. Original cost of up to $22,000 per season to keep channel open has been reduced to $3,134 for the same period.

Former method of keeping the canal open was to use crews of 12 to 15 men to detour slush ice through open cut in ice. Crews worked constantly in 0 to −50F weather, sometimes for a month or more. Strong winds occasionally blew men into the water or they would slip and fall in. Furthermore, these efforts to keep channel open were not always successful.

Container Eliminates Blanket Damage



P. N. WOODSON, General Foreman, Street Lighting, Potomac Electric Power Co, Washington, D. C.

Complete protection is assured rubber insulating blankets on Potomac Electric Power Co's line trucks by sheet metal containers mounted as shown. Formerly, blankets were subject to damage when carried in trucks along with tools, chains and other equipment. Containers are galvanized metal and are 3 ft long wth 6 in. diameter.

BLANKET PROTECTION is provided by a sheet metal container mounted on a truck

NUMBER FOUR OF A SERIES

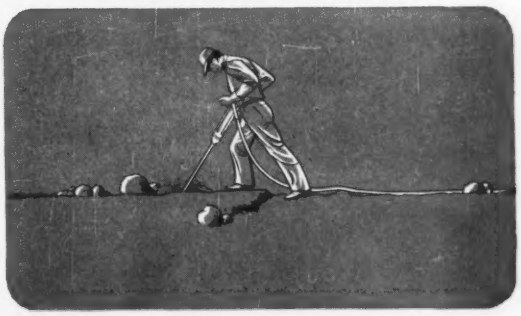
TIPS FOR BETTER ANCHORING...

How to install Anchors in Rocky Areas

ROCK ANCHORS are used where bed rock lies close to the earth surface. The Chance Expanding Rock Anchor installs in a small drilled hole and expands to wedge against the sides of the hole. Load strain increases this wedging action. This anchor requires no concrete or lead grouting—cuts installation costs. Note simple procedure shown at right.

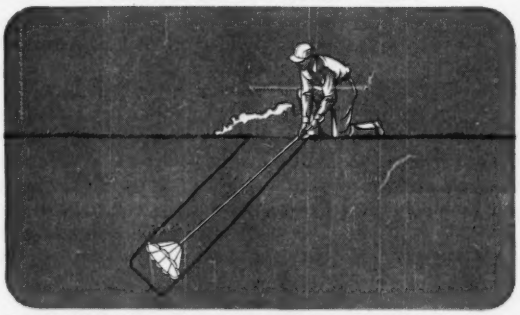
CONE ANCHORS are used in rocky earth formations where moisture content is low. Chance Steel Cone Anchors have eight flat faces that wedge against the tamped rock fill. A serrated flaring base supports the rock at the bottom of the hole to increase the effectiveness of this wedge. A nut retainer aids installation.

TO ANCHOR IN SOLID ROCK

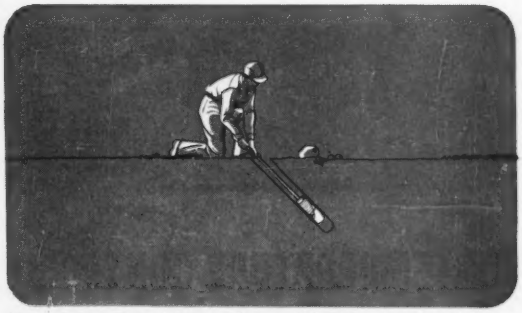


1. Drill the hole, in line with the guy, using a power driver or hand-operated rock drill.

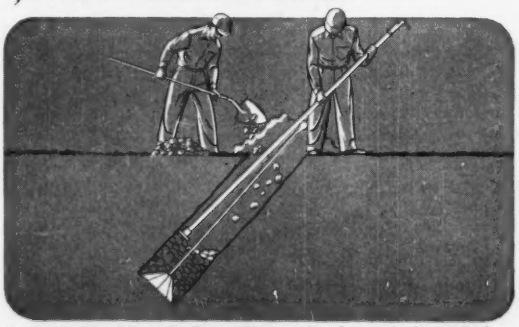
TO ANCHOR IN ROCKY SOIL



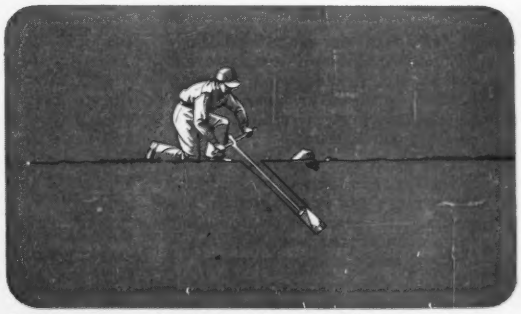
1. Drill hole, in line with guy, by hand or machine. Hole should be same diameter as the anchor for best wedging effect of tamped rock. Lower anchor into hole.



2. Drop anchor to bottom of hole. Hole diameter should be ⅛" to ¼" larger than the unexpanded anchor.



2. Back fill with rock. Tamp thoroughly. As strain is applied the rock wedges between cone and wall of hole to lock cone securely.



3. Expand the anchor by inserting a steel bar or section of pipe through Thimbleye and turning. Tighten the guy—and you're through.

You GUY WITH CONFIDENCE when you BUY FROM CHANCE

Reprints of this advertisement are yours for the asking. Request Form 54, Special Anchors. Write A. B. Chance Company, Centralia, Mo.

C53-11

ABC INDUSTRIES

A·B·CHANCE CO·

CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

ANCHORS • GUYING FIXTURES • LINE CONSTRUCTION TOOLS • CONDUCTOR CLAMPS
GROUNDING EQUIPMENT • HOT LINE TOOLS • HIGH VOLTAGE SWITCHES • CUTOUTS

Another new development using

B. F. Goodrich Chemical *raw materials*

B. F. Goodrich Chemical Co. does not coat these controller parts. We supply only the Geon raw material.

TEMPERATURE CONTROLLER PARTS PROTECTED FROM ACID!

YOU need a concentrated phosphoric acid solution to reveal cracks, etc., in defective jet engine blades—but this can mean trouble for the temperature regulator controlling the acid bath.

The bulb and capillary of the regulator is immersed in the bath. Formerly, these ordinary stainless steel or lead-coated elements couldn't stand the acid; they would last two or three months and short out.

The engineers tried coating these elements with a plastisol made from Geon paste resin. It works perfectly—the plastic coated parts show no deterioration after a year's steady use!

This example may give you an idea for developing or improving more saleable products. For Geon-based plastisols—and other Geon resins, latices and compounded plastics—have many applications. They may be used in coating, dipping, casting or molding operations to provide resistance to many chemicals, oil, grease, heat, cold and abrasion. We'll help you select the Geon material best suited to your needs. For technical information, please write Dept. GJ-13, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS...the ideal team to make products easier, better and more saleable
GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

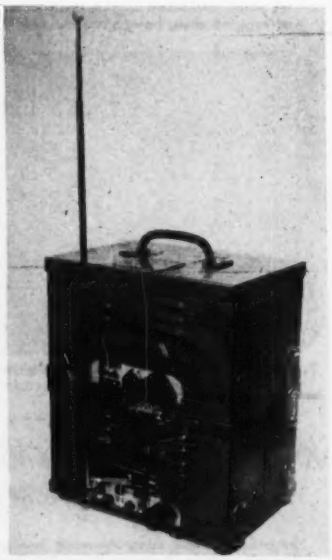
Portable Radio Receivers Aid Crews, Show Savings

J. H. GIBSON, Communications Section, System Operating Dept, Indiana & Michigan Electric Co, South Bend, Ind.

Ten portable radio receivers have effected monthly savings in excess of $125 after public telephone service was discontinued at stations. Receivers are used by crews working at stations and in manholes when radio equipment in vehicles is not in operation or when call-ins are not scheduled. Travelling switchmen standing by at stations for instructions also use the receivers.

Units were constructed from obsolete mobile receivers that were replaced by new equipment. Obsolete receivers, 10 years old or more, were unsuitable for mobile operation in areas where adjacent channels were used by another utility. However, this situation does not affect operation of the portable units because they are used mainly within reasonable range.

Each unit consists of two receiver cases fastened together, as illustrated. A built-in speaker, controls, and power supply for converting from 120 v ac to 6 v dc are in the top case. Other components are in the lower case. Interconnecting cable is an 8-conductor TV rotor cable with octal plugs on each end, which permit interchanging cases. A telescoping antenna plugs into the receiver and is braced by an insulator on the upper case.



PORTABLE RECEIVER was converted from an obsolete unit at a cost of $40

More Hydro Power from Osage

The design and construction of the initial installation of the Osage Hydroelectric Development, comprising six units of 23,887 kva each, was completed by Stone & Webster Engineering Corporation in 1931.

To provide additional power to meet the system's growing requirements, and following an engineering analysis by the engineers of Union Electric Company of Missouri, decision was reached in 1951 to employ Stone & Webster Engineering Corporation to install two additional units of 23,887 kva each, bringing the total capacity of Osage to 191,096 kva.

STONE & WEBSTER ENGINEERING CORPORATION

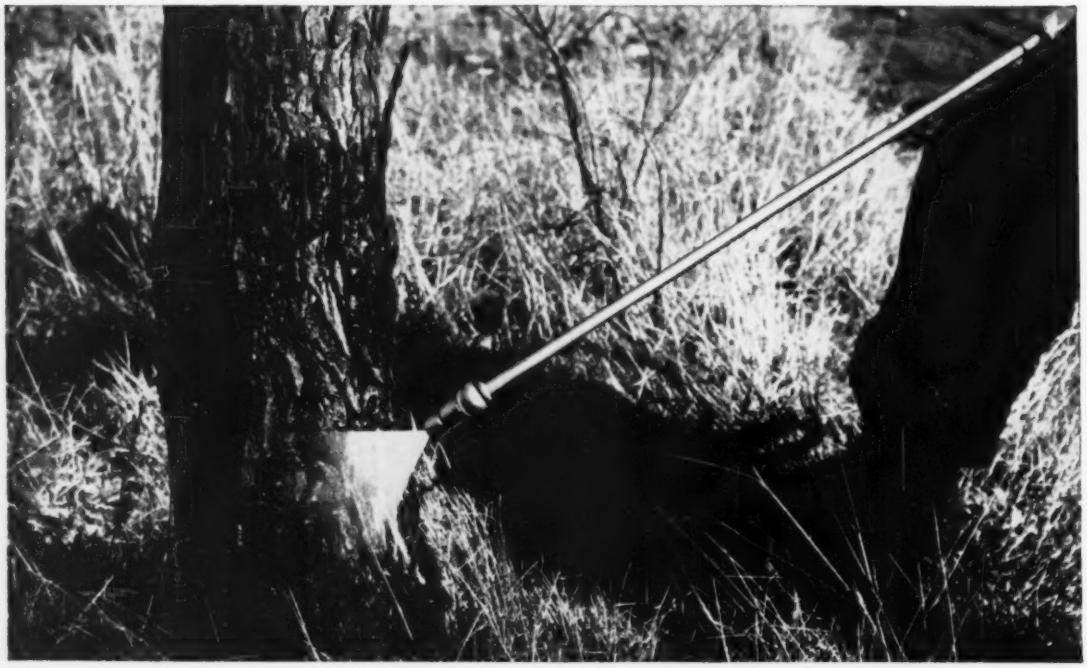
A SUBSIDIARY *of* STONE & WEBSTER, INC.

DOW

THERE IS NO "OFF-SEASON" FOR DOW BRUSH KILLERS

Basal bark treatment with ESTERON 245

or ESTERON BRUSH KILLER gives you good control in all seasons



Brush control with Dow brush killers is *always* in season. When your spraying program includes basal bark treatment of dormant brush and trees in addition to regular foliage spraying, you keep your crews busy and your equipment in use more months each year.

Winter has been established as a good time for basal bark application. This important maintenance practice —spraying Esteron® Brush Killer or Esteron® 245 in oil on the basal 12 to 15 inches of brush stems or tree trunks—has proved its worth on many miles of roadside and right-of-way spraying.

Esteron Brush Killer is a mixture of low-volatility propylene glycol butyl ether esters of 2,4-D and 2,4,5-T. Esteron 245 contains the same type esters of 2,4,5-T only. Both products are effective for foliage and year-around basal bark spraying—for chemical treatment after frilling—and for spraying freshly cut stumps to prevent resprouting. Dow sales and technical men are available for consultation and assistance. We offer valuable technical literature on right-of-way vegetation control with Dow brush, weed and grass killers. THE DOW CHEMICAL COMPANY, Agricultural Chemical Department, Midland, Michigan. In Canada: Dow Chemical of Canada, Limited, Toronto, Canada.

you can depend on DOW AGRICULTURAL CHEMICALS

DOW

Parts necessary to make this conversion cost less than $20. Labor expense was approximately the same because work was done as a fill-in job.

Simple Jacks Lift 15,000-lb Reels

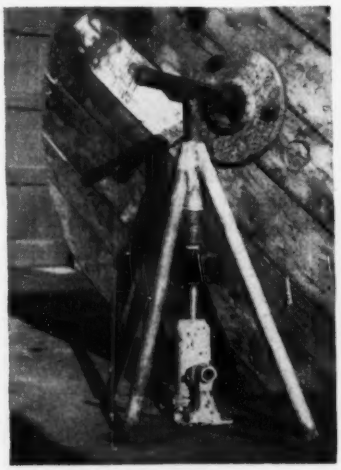
GENE J. NEWMAN, Construction Supt, Civil Aeronautics Administration, Seattle, Wash.

Cable reels weighing up to 15,000 lb may be lifted into position easily for unreeling on two simple jack stands made from steel conduit and plates. Hydraulic jacks of 5-ton capacity or greater are used to provide lifting power. Cost of two stands, not including jacks, is about $17.

Stand consists of a T-base made from ¼ x 4-in. steel plates welded to supporting arms of 1-in. conduit. Arms are welded to a length of 1¼-in. steel conduit. A steel bar of 1¼-in. diam with a short piece of angle steel on one end fits inside the conduit. Bar is short enough so that a hydraulic jack in lowest position may be placed under bar on T-base.

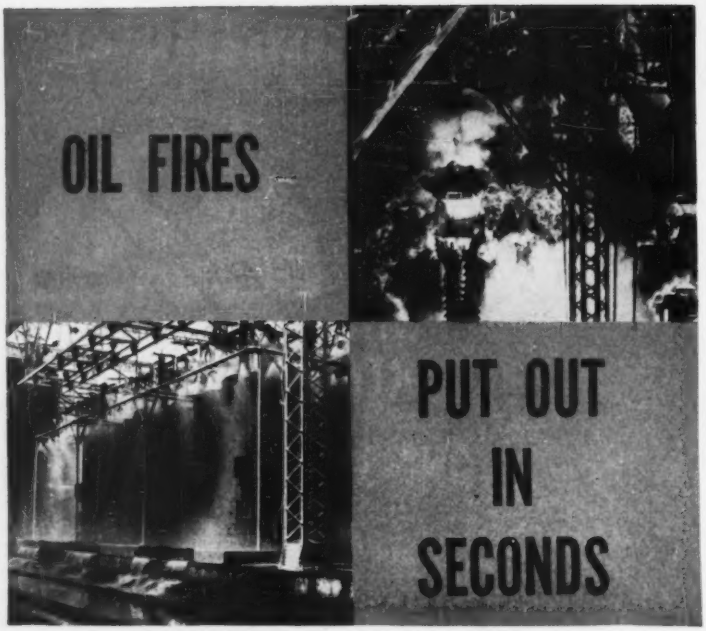
With reel positioned for unloading, stands are placed on either side and lifting bar is pushed through reel to extend over steel angles. Jack is raised until reel is at proper height for unreeling.

Although stands were designed for use with reels of submarine telephone cables, author reports they are just as useful in unreeling 250-lb reels of cable.



JACK STAND made from steel conduit and plates uses hydraulic jack for lifting power

VOLTAGE UP
COST DOWN!
Artie One-step
WITH RTE (artie) ONE-STEP
RT&E Co.'s VOLTAGE REGULATOR
GET LOW COST REGULATION
Extend the load life of your distribution lines to their fullest before you spend large sums of money on reconductoring, rephasing, and adding substations.
R T & E's "Artie" One-Step Regulator is the quickest easiest, and most economical way yet devised to correct voltage drop and increase the load life of your lines.
In less than 24 hours you can engineer line requirements, locate regulator position, and install "Artie" One-Step Regulators in service.
Be smart—do it the R T & E way.
For complete details on operation, construction, and installation, write for booklet "OSR-1."
632 N. 8TH ST. MILWAUKEE 3, WISCONSIN
RT&E Co.
BRANCH PLANT: WAUKESHA, WISCONSIN



with fast-acting, time-tested

GRINNELL MULSIFYRE

When a fire breaks out in a transformer protected by a Grinnell Mulsifyre system, a battery of spray projectors put out the fire . . . in seconds! If automatically controlled, heat actuates the release device. Otherwise, extinguishment follows operation of the manual controls.

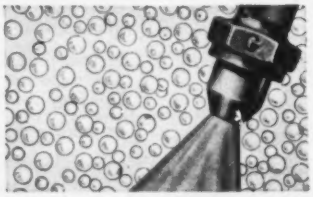
The following actual case histories demonstrate the effectiveness of Mulsifyre Systems.

In an Industrial Plant — A 750 KVA self-cooled transformer explosion blew off the transformer cover and fire occurred. The automatically controlled Mulsifyre System extinguished the fire in a few seconds.

At a Paper Mill Power Plant — Turbine oil escaped under pressure and flashed from 660 degree steam connections. The manual operation of a fixed Mulsifyre System extinguished the fire at once.

At another Industrial Plant — An arc burned an inch and a half hole in the casing below the cover of a 5000 KVA self-cooled transformer — dumping 300 gallons of oil. An automatic Mulsifyre System put out the fire promptly.

There are hundreds of dependable Mulsifyre installations in service all over the world. Get the facts today on how you can save trouble and expense with a reliable Grinnell emulsion-forming spray system. Write Grinnell Company, Inc., Providence, R. I. Branch Offices in principal cities.



GRINNELL *Mulsifyre*

EMULSION-EXTINGUISHMENT OF OIL FIRES

INDUSTRIAL BRIEFS

Heat treating with electric furnaces at F. H. Lawson Co, Cincinnati, Ohio, manufacturers of bathroom cabinets and other sheet metal products, has replaced gas-fired equipment. A more uniform temperature and more accurate control of temperature has resulted in reduced loss and spoilage of tools and dies with a resulting cost reduction. The automatic control and timing features enables the furnace to be started automatically before the men arrive at work so that it will be up to temperatures when they start work. This feature has increased production. Also, proper hardening can now be obtained. One furnace, of the vapor carborizing type with a cracking unit, is rated 25-kw, 230-v, 3-phase. It is used for heat treating steels requiring temperatures up to 1800 F. The other is a homo type furnace which is rated 30-kw, 230-v, 3-phase and is used for treating steels requiring temperatures in the 800 to 900 F range. L. J. Langevin, Power Engineer, Cincinnati Gas & Electric Co.

Heating pipe lines which feed paint into spray booths at Littleford Brothers, Inc, Cincinnati, Ohio, provides complete paint coverage and a smoother finish. Two 3-kw, 230-v, 1-phase, resistance heating elements encircle the pipe lines so that the paint is heated before it enters the spray booth. This keeps the electrical equipment outside of the hazardous spray booth atmosphere which is classified as a Class I, Group D location. Thermostats control the paint temperature and limit it to a safe value. L. J. Langevin, Power Enginer, Cincinnati Gas & Electric Co.

Cleaning steel with a new type of immersion heater installed in the alkali bath at F. H. Lawson Co, Cincinnati, Ohio, speeds the operation and produces clean surfaces. This 3-kw, 230-v, 1-phase, "Clepco" heater utilizes a fused quartz sheath which is impervious to action of acids and alkalis. In this process the alkali is heated by the immersion heater, and the sheet steel is dipped into the hot alkali bath. Temperature of the alkali is thermostatically controlled. L. J. Langevin, Power Engineer, Cincinnati Gas & Electric Co.

ALL FARGO CONNECTORS are "VISE-TYPE"

FOR..Better Performance
High Compression
Low Torque
Fast...Easy Installation

The "5000" Series Standard Connectors in bronze are of one-piece construction with protected thread providing a low resistance, vibration-proof joint. Available for #8 sol. to 1,000 MCM.

The "7000" Series Heavy-duty Connectors in bronze or aluminum. Heavy spacer for conductor separation. Wide contact area of curved jaws minimize cold flow and conductor distortion. Large mass for better heat dissipation. Available for 6 sol. to 1000 MCM.

The "8000" Series All-purpose Connectors in bronze or plated bronze. High conductivity umbrella spacer gives good conductor separation minimizing galvanic corrosion. Wide ranges permit 5 connectors to handle sizes from 8 sol. to 350 MCM.

The "9000" Series Aluminum Connectors in aluminum with bimetal inserts for "like metal" contacts. Large jaw areas reduce cold flow and help overcome high contact resistance of aluminum. ... greater mass cuts temperature rise. Available from 8 sol. to 500 MCM.

Ask your Line Material Field Engineer to give you complete details.

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

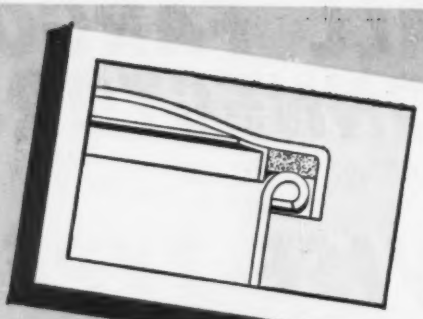
Poughkeepsie, N.Y.

Distributed by

LINE MATERIAL COMPANY

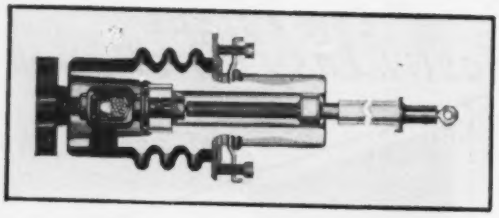
(A McGraw Electric Company Division)

Milwaukee, Wisconsin



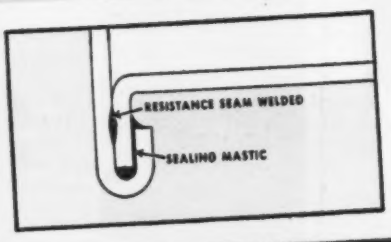
POSITIVE SEAL TANK COVER

Moloney's newly developed tank seal offers all the desirable features for distribution transformer tank covers—completely retained by means of a welded-in retainer ring. Retainer serves as a stop for corprene gasket and a return for splashed oil. Gasket is stretched around retainer, not cemented. May be used time and time again. Corprene affords a positive seal, impervious to oil, gas and moisture.



HIGH VOLTAGE SIDEWALL BUSHINGS

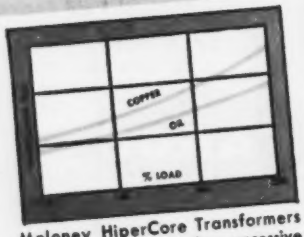
Moloney's sidewall mounted high voltage bushings are designed with features to provide ease of installation. Molded phenolic—cold rubber combination caps provide tightening knob for working hot. Tapered cable openings permit easy entry from either side of copper or aluminum conductors. Bushing amply meets all NEMA requirements.



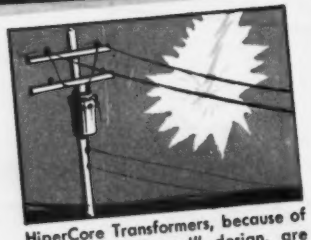
WELD AND ROLLED LIP ON TANK BASE

Tank base is pressed into tank shell and resistance seam welded. A sealing mastic compound is applied and the extending portion of the tank is rolled in to provide triple protection against mechanical abuse. Water or condensation cannot gather at this point to form rust and corrosion.

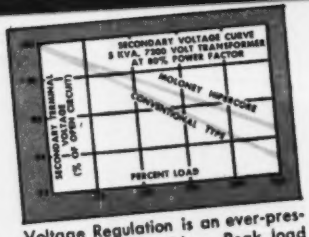
ME53-49



Moloney HiperCore Transformers show to advantage when excessive overload conditions exist. The deteriorating effect of high winding insulation temperatures shortens the life of transformers. HiperCore Transformers maintain a lower hottest-spot-over-oil temperature thus reducing the deteriorating effects such overload conditions impose on winding insulation.

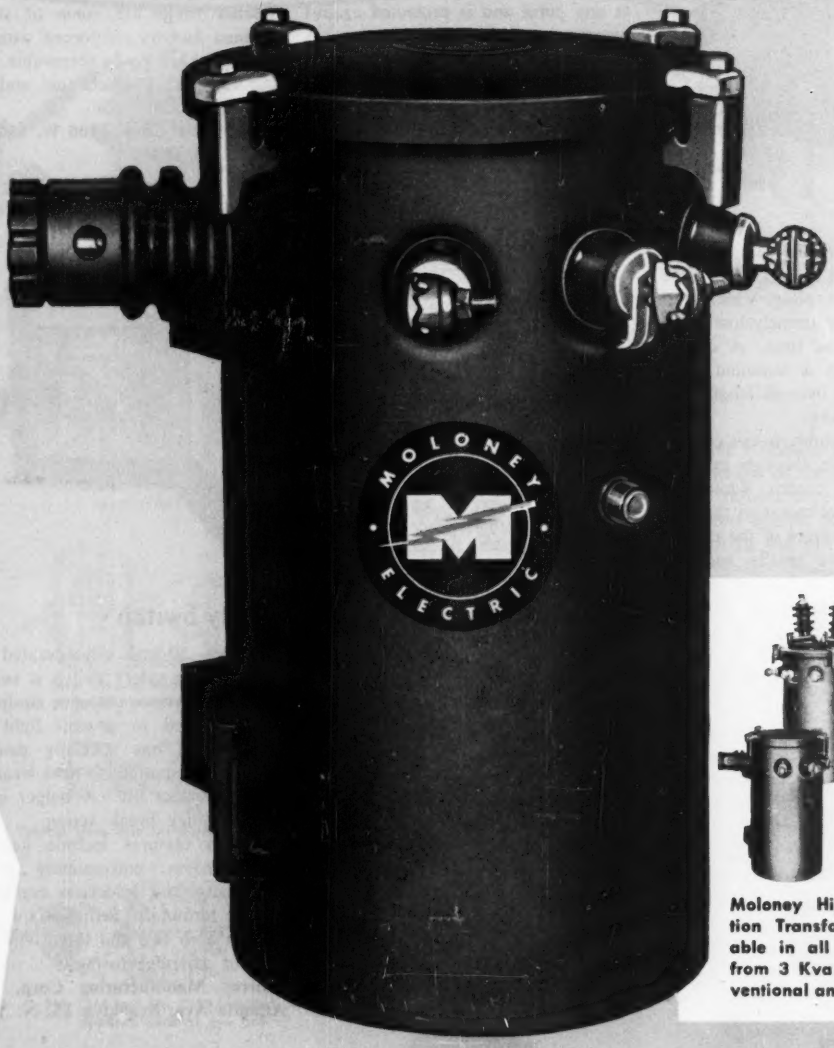


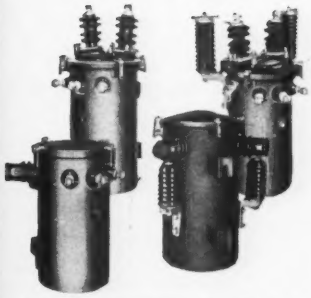
HiperCore Transformers, because of their "Surge-Proved" design, are highly resistant to the effects of switching and lightning surges. Exhaustive surge tests and years of design experience have enabled Moloney Engineers to develop a uniformily high insulation level throughout the entire HiperCore Transformer. Proved by years of successful operation.


SECONDARY VOLTAGE CURVE
5 KVA, 7200 VOLT TRANSFORMER
AT 80% POWER FACTOR
SECONDARY TERMINAL VOLTAGE (% OF NO LOAD VOLTS)
PERCENT LOAD

Voltage Regulation is an ever-present operating problem. Peak load and off-peak load conditions must all be handled with minimum installed capacity. The smaller cores of HiperCore Transformers make possible windings having lower impedance. Lower impedance provides lower voltage drop at all loads. Improved voltage regulation is the result.

MOLONEY *HiperCore* DISTRIBUTION TRANSFORMERS





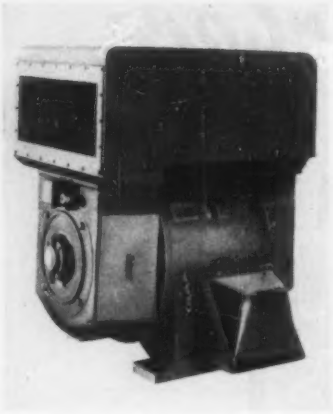
Moloney HiperCore Distribution Transformers are available in all standard ratings from 3 Kva up in both Conventional and CSP designs.

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations

FACTORIES AT ST. LOUIS 20, MISSOURI AND TORONTO, ONTARIO, CANADA • SALES OFFICES IN ALL PRINCIPAL CITIES

NEW EQUIPMENT



Dc Motor

A new compact totally-enclosed dc motor available in ratings from 15 to 200 hp features cooling, which permits operation at extremely low speed for long periods of time. A double system of blowers is mounted completely within the over-all length and width of the motors.

One blower assembly forces cooling air from the room through external passages of the cooler, while the other forces internal motor air through closed internal passages of the cooler. Blower motors are totally enclosed and supplied from a 3-phase, 60-cps source. A thermostatic relay protects the main motor in case of blower motor failure or will sound an alarm.
General Electric Co, 1 River Rd, Schenectady 5, N. Y.

Pressure Cell

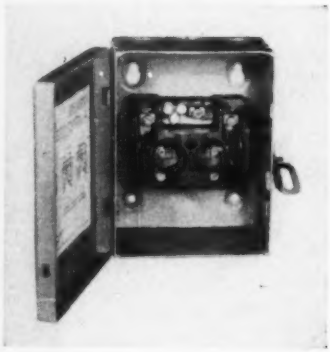
A new transducer, the Dynaformer pressure cell, converts fluid pressure into a proportional ac voltage that is measured in terms of pressure by an electronic resistance instrument. The cell consists of a Bourdon pressure spring linked to a copper ring, which surrounds the iron core of a differential transformer. Responding to fluid pressure, the spring positions the ring, inducing a voltage in the output winding proportional to the fluid pressure.

Cell is accurate to within ±½% at any point and is protected against overrange to 150% of its rating. A self-contained adjustment enables matching the transformer zero to the instrument. Any pressure range between 0 to 30 in. Hg and 0 to 10,000 psi is available.
Foxboro Co, Neponset Ave, Foxboro, Mass.

Aerial Ladder

A mechanical aerial ladder, 2200 MAL, that can be mounted on almost any type body and chassis solves high overhead installation, service, and maintenance problems. It is available in three sizes—23, 27, and 31 ft ground to platforms heights. Full extention, elevation to 72 deg, and 360 deg rotation can be accomplished by one man operating hand cranks on the ladder pedestal mast.

A chrome vanadium alloy counterbalancing spring concealed in the mast provides easy ladder operation. Manually operated lock pins hold the ladder in any of eleven positions. Ladder rungs are made of straight grained hickory reinforced with steel rods, and are easily removable. Ladder rails are steel channel and truss rod reinforced.
J. H. Holan Corp, 4100 W. 150th St, Cleveland, Ohio



Safety Switch

A new 30-amp side-operated general purpose safety switch is suitable for use as service entrance equipment and designed to protect light machinery. It has specially designed built-in arc snuffers to save wear and extend contact life. A helper spring assures quick break action.

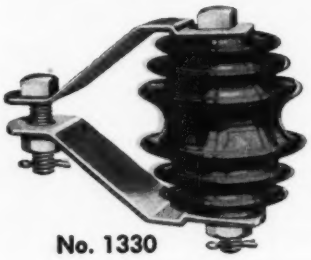
Switch features include generous wiring room, conveniently located knockouts, and solderless connectors on line terminals. Switches are available in both two and three wire with plug or cartridge fusing.
Murray Manufacturing Corp, 1250 Atlantic Ave, Brooklyn 16, N. Y.

Measuring Instrument

A new ac and dc, current and voltage, measuring instrument has 8? ranges that overlap each other so tha. all reading can be taken on the upper

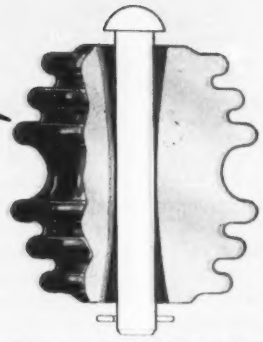
Better DESIGN

Gives Greater Strength



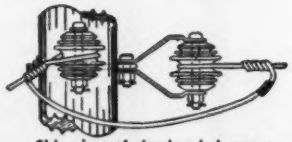
No. 1330

No. 1344

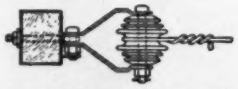


Cutaway view of No. 1613 Insulator showing the Insulator Bolt Hole Design slightly exaggerated.

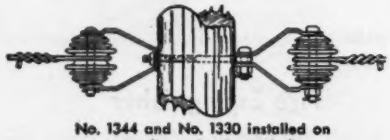
Installation of two No. 1330 on eye bolt and eye nut



Side view of dead-ended corner installation of two No. 1330



Typical cross arm installation of No. 1330



No. 1344 and No. 1330 installed on opposite ends of eye bolt

A mechanical feature of these Hubbard Clevises, not generally known, is the design of the bolt hole in the insulator, known as the "double tapered hole" as illustrated by the cut-away view above. Its purpose is to develop maximum strength in the porcelain. Most insulator failures, under heavy line load, start at the outer ends of the hole. This is due to the slight "bowing" of the bolt under loading, which results in concentrated "high point" pressures on the porcelain at the ends of the hole.

The "tapered" design, on the contrary, transfers the strain from the ends of the hole to the center portion of the insulator during the first stages of the loading. The center portion is stronger and presents a larger area, resulting in a lowered pressure. As the loading is increased, the bowing of the insulator bolt continues until it conforms to the taper of the hole, at which stage maximum resistance to the load is offered.

It is this design which has established these Hubbard Clevises as the high strength, quality products which they have been down through the years.

Electrically and mechanically . . . they are better.

HUBBARD AND COMPANY

ESTABLISHED 1843

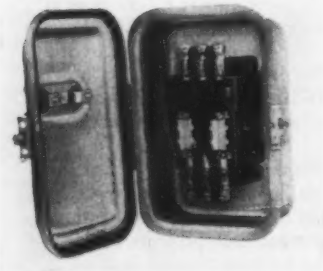
PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

half of the scale. Its accuracy is said to be 0.5% on dc and 0.75% on ac. It has automatic temperature compensation on all ranges.

There are 24 dc current ranges from 200 microamperes full scale to 1.5 amp; 28 dc voltage ranges from 20 mv full scale to 750 v; 16 ac current ranges from 10 ma full scale to 3 amp; and 20 ac voltage ranges from 0.5 to 750 v. Frequency response is up to 15,000 cycles. Panel engraving is colored in red and white to facilitate selection of ranges.

Sensitive Research Instrument Corp, 9-11 Elm Ave, Mount Vernon, N. Y.



Starting Switch

A new across-the line, manual starting switch, Type LM, is designed for single or multiple shuttle textile looms. It is housed in a lint-proof enclosure of heavy gage, formed steel with a free-swinging hinged door and a balloon type neoprene impression gasket.

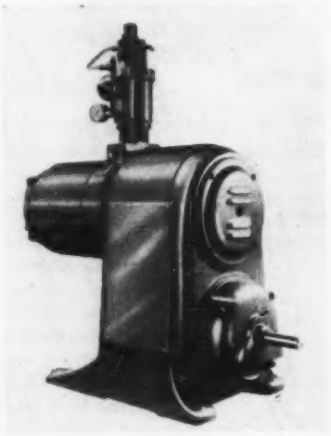
Mechanism consists of main contacts and the overload tripping device that interrupts abnormal overloads. Overload trip utilizes knife blade contacts and has a re-set lever located within the lockable enclosure. To prevent unscheduled re-starting, the stop button must be pushed before the switch can be re-set. Wiring is brought to terminal blocks and the switch mechanism is secured to these.

Arrow-Hart & Hegeman Electric Co, 103 Hawthorn St, Hartford 6, Conn.

Speed Control

An improved pneumatic control, called Varitrol, which may be operated manually or automatically, has been designed into a line of variable speed motors. Automatic speed control by such variables as pressure, temperature, speed, or liquid level is possible.

The control operates on a supply air pressure of 60 to 100 psi applied



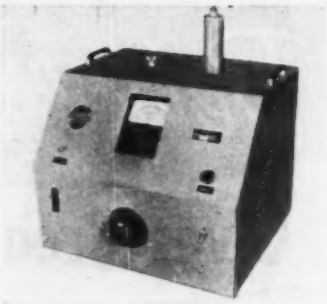
to both sides of an air cylinder. A sensitive positioner operating on 3 to 15-psi signal air controls a pilot valve regulating the power air to the air cylinder. Approximate straight line relationship between signal pressure and speed is said to result.

The Varitrol is presently available on motors from 1 to 30 hp and can be supplied up to 50 hp.

U. S. Electrical Motors Inc, Box 2058 Terminal Annex, Los Angeles 54, Calif.

Insulation Tester

A new semi-portable ac insulation tester, Model 573A Hypot, provides an output voltage continuously variable from 0 to 30 kv at 1-kva capacity. Power source required for operation is 115 v, 50-60 cps.



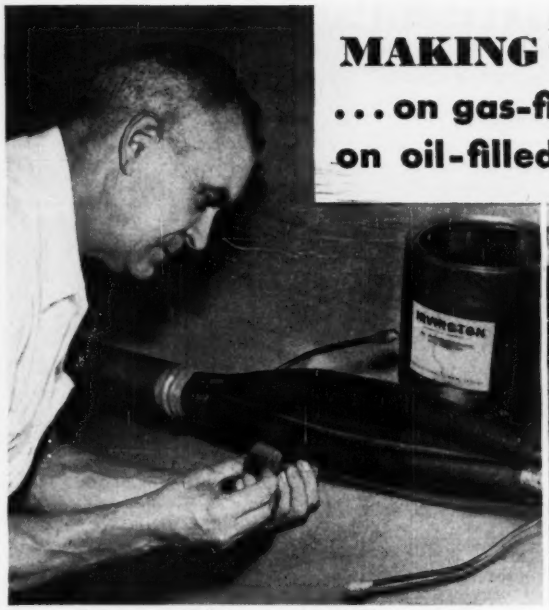
Short circuit protection is provided by a manually reset primary circuit breaker with secondary trip. Excess leakage current in test circuit is indicated by a panel-mounted neon lamp. Other equipment includes a 4½ in. output voltmeter, an on-off switch with pilot light, a non-locking push-to-test button, a high voltage stand-off insulator, and a ground terminal on top of the case.

Associated Research, Inc, 3760 W. Belmont Ave, Chicago 18, Ill.

Fire Extinguisher

A new dry chemical, stored pressure, fire extinguisher is said to be designed to assure entirely reliable performance. This is because of a non-fouling discharge valve of spherical design, a non-clogging discharge nozzle, and use of non-caking dry chemical powder pressurized with bone-dry nitrogen, up to 200 psi.

Another feature is the fast one-



Crepe paper applied on one leg of 27 K.V. — 3 conductor — 500 M.C.M. paper insulated, gas filled cable.

MAKING SPLICES
. . . on gas-filled cable?
on oil-filled cable? . . .

Oil-immersed Varnished Cambric applied on 27 K.V. — 3 conductor — 500 M.C.M. paper and lead solid type cable.

Select your insulating tapes from the complete Irvington line

For gas-filled cable, use Irvington vacuum treated, oil impregnated Crepe Paper No. 4000 — packaged in cans to meet your specific requirements for number and size of rolls. *Whenever* your needs for crepe paper are not fully met by packaged splicing kits, make Irvington your source of supply.

For oil-filled cable, use No. 5000 Yellow or No. 5500 Black Low Loss Varnished Cloth Tape — both packaged under vacuum. Or if you prefer, choose No. 6000 Yellow or No. 6500 Black Oil Immersed Varnished Cloth Tape.

OTHER IRVINGTON PRODUCTS FOR UTILITIES: *For moisture-proof, oil-tight cable splices and stop joints* on rubber, paper or cambric insulated cable, use No. 621 Harvel Oil Stop. *And for an oilproofing finishing coat* over bus bar wrappings — or for sealing pipeline joints and gaskets — apply No. 32 Red Enamel.

Look to

IRVINGTON

for Insulation Leadership

INSULATING VARNISHES
VARNISHED CAMBRIC
VARNISHED PAPER
VARNISHED FIBERGLAS
INSULATING TUBING
CLASS "H" INSULATION

Mail coupon for technical data sheets and samples.

Send this convenient coupon now

Irvington
VARNISH & INSULATOR

DIV. OF MINNESOTA MINING & MANUFACTURING CO.
21 Argyle Terrace, Irvington 11, New Jersey
Plants: Irvington, N. J.; Monrovia, Calif.; Hamilton, Ontario, Canada

Irvington Varnish & Insulator, EW 12/53
Div. of Minnesota Mining & Mfg. Co.
21 Argyle Terrace, Irvington 11, N. J.

Gentlemen: Please send me technical data sheets and samples on the following products:

☐ No. 4000 Crepe Paper ☐ No. 5000 Yellow Low Loss Tape ☐ No. 5500 Black Low Loss Tape ☐ No. 6000 Yellow Oil Immersed Tape ☐ No. 6500 Black Oil Immersed Tape ☐ No. 621 Harvel Oil Stop ☐ No. 32 Red Enamel

Name..... Title.....

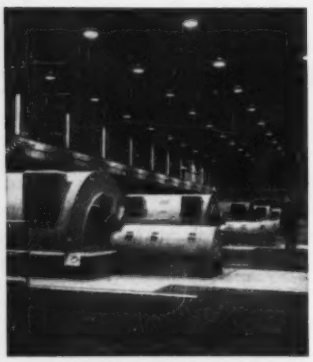
Company.....

Street.....

City..... Zone..... State.....

what's NEW in Engineering

The "swing and spill" hazard in conventional hook and crane hoisting may soon be a thing of the past, according to a midwestern laboratory. It has developed a new crane which substitutes an automatic mechanism, controlled by a small knob, for the usual operator's controls. The result is a smoother, controlled hoist. So new, this crane is still in scale model stage.



A power plant large enough to serve a city the size of Akron, Ohio, is just part of the nation's largest aluminum reduction plant designed and built by Kaiser Engineers. Installed capacity of the combined gas engine and steam generating facilities is 473,200 kw of power. A maximum of 140,000,000 cubic feet of natural gas is consumed per day. Speed was essential, so Kaiser Engineers had the plant producing power only eight months after groundbreaking. We'll send you an illustrated folder on request.

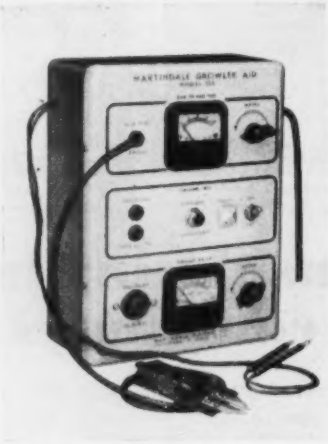
Instrument Engineering is a valuable new book by Draper, McKay and Lees. In two volumes (the second out this June), it is a comprehensive reference book for the practicing engineer—and an outstanding contribution to the theory of instrument engineering.

Incidentally, Kaiser Engineers has approximately 600 professional engineers, technical experts and staff ready to tackle your problem in design, engineering or construction. Call or write: Kaiser Engineers Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.

hand operation made possible by a squeeze grip and a lever locking cam that is released quickly by pulling back with thumb. Units are available in 3 to 20 lb capacities.
Stop-Fire, Inc, 125 Ashland Place, Brooklyn 1, N. Y.

Tester

A new growler aid checks for short circuits, open circuits, and grounds and is claimed to refine tests on armature and stator windings before assembly. Sensitive meters on the short-test and bar-to-bar-test sections of the Model 153 show up defects by means of comparative readings.
Martindale Electric Co, 1371 Hird Ave, Cleveland 7, Ohio

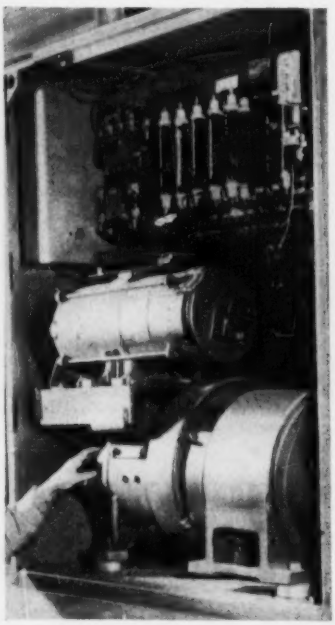


Carriage Drives

A new line of speed-variator log-carriage drives for small and semi-portable mills feature easy installation, finger-tip control, packaged power, and high drive efficiency. Drives are available in ratings from 7½ to 30 hp, 220 or 440 v, and include a driving motor, a packaged power unit, an operator's master switch, two over-travel limit switches, and a push-button station.

The power package contains a four-unit MG set, an amplidyne control panel, an ac motor control, and dc line contactor and dynamic braking resistors. All are enclosed in a single self-supporting panel. Regenerative braking is used for normal carriage stops. If ac power is lost during operation, the carriage is stopped by dynamic braking.

For safety, overtravel limit switches near each end of the carriage track automatically stop the carriage, if the operator does not stop it. Thermal overload relays protect the ac motor and the dc motor and generator. Fuses provide short circuit protection.
General Electric Co, 1 River Rd, Schenectady 5, N. Y.



Fuses

A new line of dual-element fuses are applicable where long and controlled blowing time is desired. Protection extends up to 500% overloads with provision for immediate blowout on short circuits. Sizes available are from 0 to 600 amp, in both 250 and 600 v, and in ferrule and knife-blade types. All are UL approved.

On the ferrule type 0 to 7 amp fuses, a coiled thermal element actuates the overload element. On the ferrule type 8 to 60 amp, 250 v, and the 8 to 30 amp, 600 v, fusible links are used with high-temperature-resistant coiled springs on the overload interrupter. On all knife-blade sizes and on 35 to 60 amp, 600 v, ferrule

WE MAKE OUR OWN RAIN . . .

Victor No. 245-R Transmission Pintype undergoing standard EEI-NEMA wet flashover test in the Victor Laboratory.

TO GIVE YOU

PROVEN WET WEATHER PROTECTION

The superiority of Victor design and manufacture is proven in the laboratory as well as in the field. Take Victor High Voltage Pintypes, for example. Here, in the wet flashover test shown above, the insulator is being subjected to controlled artificial rain while 60-cycle current is applied in gradually increased voltage steps until flashover occurs.

This is only one of the many tests which are constantly being made in the Victor Testing Laboratories, to assure you of highest quality and conformance to specifications. That is why Victor Transmission Pintypes give you proven wet weather protection and longer, trouble-free service on your lines. Choose Victor the power man's best buy!

VICTOR No. 245-R
EEI-NEMA Class 56-3

FREE BOOKLET gives you the full story of how Victor Insulators are made, how and why Purified Porcelain was developed. Write us for your copy.

Specify VICTOR INSULATORS

VICTOR INSULATORS, INC., VICTOR, N. Y.

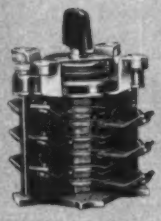
Low and High Voltage Pintypes • Suspensions • Guy Strains • Spools • Switch and Bus Insulators • Custom Designed Porcelain

ROTARY SWITCHES

For every control, tap, and transfer application.

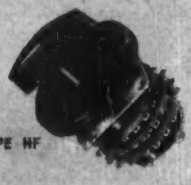
TYPE JR

TYPE A



TYPE P, 30A

TANDEM TYPE P, 30-10A



TYPE HF

- Save valuable panel space
- Simplify control of complex circuits
- Give "dead-front" mounting safety
- Listed by Underwriters Labs, Inc.
- Can be furnished to latest Navy specs.
- Ratings from 2 amperes to 200 amperes, 30 to 250 volts d. c., and 125 to 500 volts a. c. — depending on number of circuits and nature of load.

Write for combined catalog giving useful design data on Esco rotary switches.

ELECTRO SWITCH
CORPORATION
167 King Avenue, Weymouth 88, Mass.

sizes, two fusible links are bonded to a time lag element.
Economy Fuse & Manufacturing Co, 2717 N. Greenview Ave, Chicago, Ill.

Tester and Puller

A new test light and fuse puller for circuits up to 600 v is made of transparent red Tenite, high-dielectric plastic. Jaws are shaped to hold all cartridge fuses up to 100-amp size and the inside surfaces are serrated to provide a good grip. The test lamp is of the neon type with a resistor.

Two 24-in. flexible leads are furnished with each tool. One lead has a 4-in. plastic handle prod, the other a spring clip with safety rubber jacket.
Holub Industries, Inc, 413 DeKalb Ave, Sycamore, Ill.

Soldering Unit

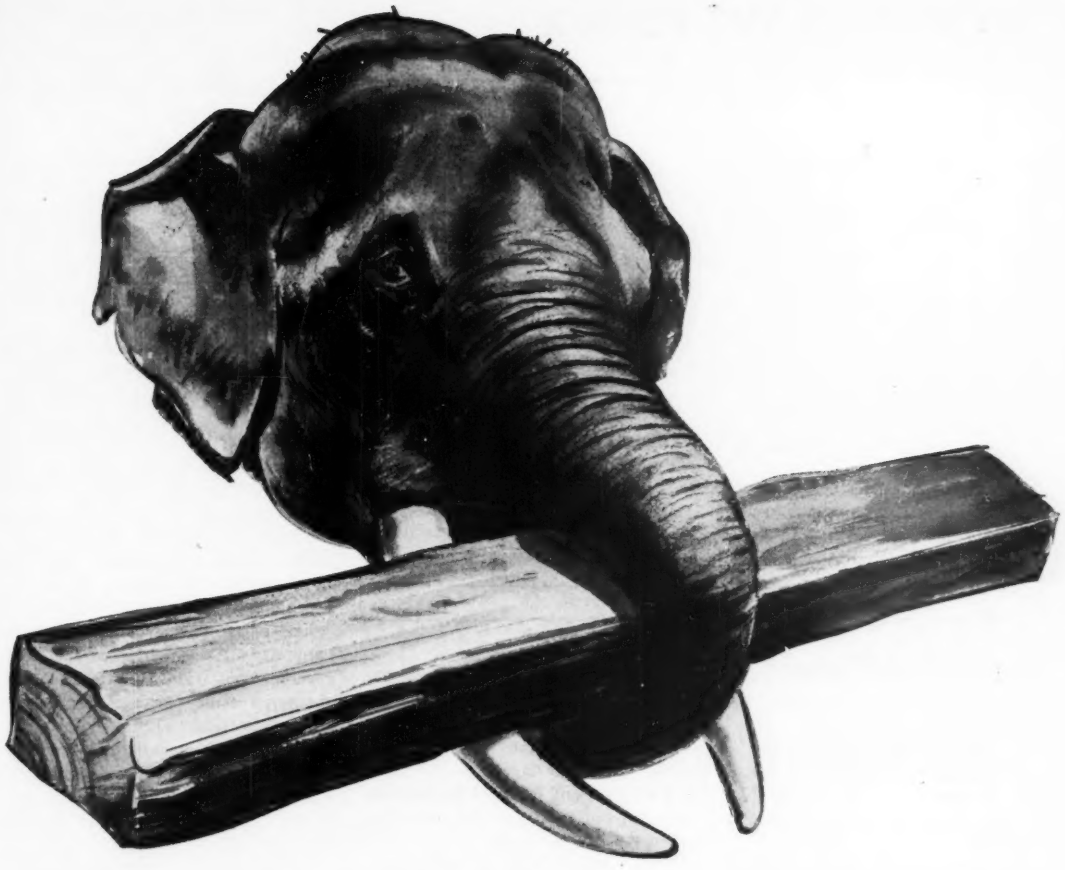
A new soldering unit features instant heat, adjustable heat control, light weight, and no shocks or burns, and is easy to operate. It is rated at 450 w, 117 v ac, 60 cps and furnishes heats up to 1,600F.

Binding posts for use of electrode holders are provided to make the unit more practicable. Timing attachments and ground plates are available.
Vemaline Products Co, P. O. Box 222, Hawthorne, N. J.

MORE NEW PRODUCTS
about which you should know

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa., announces a new line of open dropout **fuse cutouts,** Type DX, for use on 5, 2, 7.8, and 15-kv distribution systems . . . General Electric Co, 1 River Rd, Schenectady 5, N. Y., has a **watthour meter** that can be converted in the field from 2-wire, 120 v to 3-wire, 240 v.

Allegheny Plastics, Inc, 252 Thorn Run Rd, Coraopolis, Pa., announces two new plastic **warning signs** . . . Allied International Inc, Connecticut & Richards Ave, South Norwalk, Conn., has a new dc **power supply.**



RESERVE STRENGTH For Emergencies

THANKS TO BATTERY POWER!

All standby batteries are *not* alike. Gould Planté is different. It is the only battery available today with positive plates of pure lead—plates that enable the battery to renew itself as it floats. Whether you need a powerful surge or a steady flow, Gould Planté has abundant power in reserve, ready for emergencies today, tomorrow or years from now.

Specify
THE GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

GOULD *INDUSTRIAL BATTERIES*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

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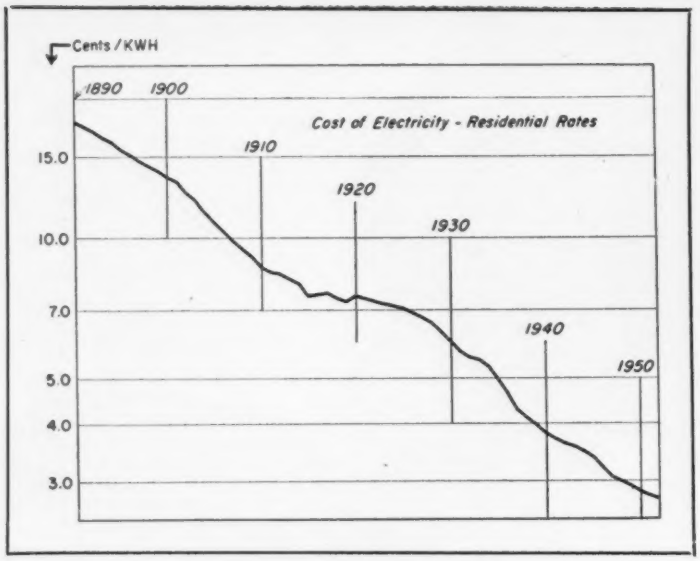
LETTERS TO THE EDITOR



Rates Are Down, TVA or No

To the Editor:

I noted in the Oct. 19 issue on page 107, your report of Tennessee Gov Clement's support of the TVA, and that he is repeating the familiar statement:

"TVA's 'yardstick' power rates have served as an example or inducement to private power companies the country over. As a result, the national average electric rate has been cut 60%."

I should think it would be desirable to point out in connection with this discussion of the merits of the TVA, the long term record of the electric utilities in reducing power rates. I have charted a history of average residential power rates from 1890 through 1952. These data were taken from the EEI Statistical Bulletins for the period 1926-1952. For years prior to 1926, I found an index of average residential power rates on page 4 of the National Electric Light Association publication #267-64. This was a convention report of the Rate Research Committee of N.E.L.A. presented in 1927.

While, as you know, there are slight differences in the methods of reporting throughout these years, nevertheless, the trend is very clearly indicated. It seems probable that the reduction in residential power costs through the middle 1930's might well have come about regardless of TVA, because of the reduced cost of materials and labor through that period. You will note that the downward trend was accentuated about 1926 which, of course, was long before TVA was contemplated. As a matter of fact, the decade from 1900 to 1910 shows about the same per cent decline as the decade from 1930 to 1940.

Actually, of course, this reduction in residential power rates is primarily a reflection of the technology of the electrical industry as well as greatly increased use.

A. K. Gaetjens
General Electric Co
Cleveland, Ohio

"Big Jim" is Jake

To the Editor:

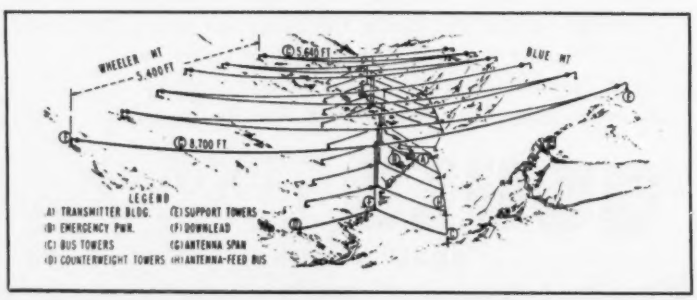
We noted with interest the item in the Nov. 30 issue of Electrical World on the world's most powerful radio transmitter, operating at 1,200 kw. This $14 million transmitter, dubbed "Big Jim," is located in the Cascade Mountains, 55 miles northeast of Seattle, Wash.

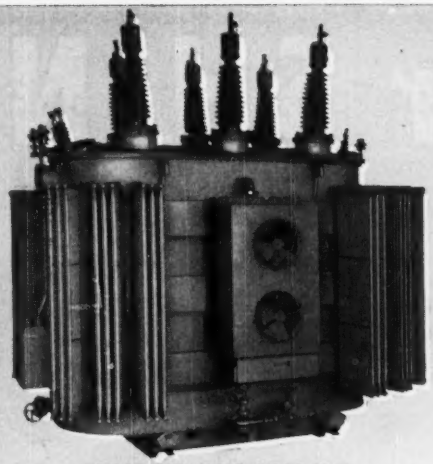
The unique aerial used for this transmitter is the first of its type and the largest ever built, being suspended between mountain ridges to eliminate the need for high towers. This antenna consists of ten catenary spans of cable arranged in zig-zag fashion, varying in length from 5,640 to 8,700 feet. To withstand ½-inch radial ice in a 65-mile-per-hour gale, a 1.01-inch cable spun from 37 strands of No. 7 extra-high-strength Copperweld wire was used.

It was essential that these cables have extra high strength and rust resistance as well as high conductivity. About thirty miles of Copperweld cable went into the antenna system.

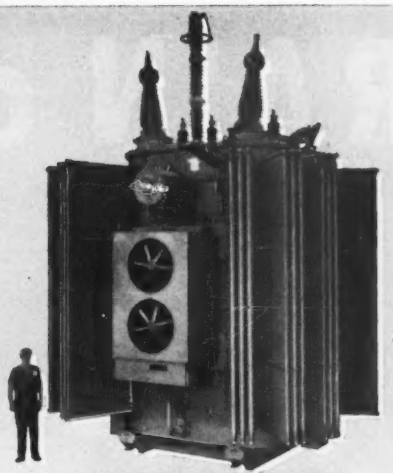
The Navy has indicated that this entire project is one of its "most important contributions to the nation's security." Reason for this is that the fierce magnetic storms frequently have paralyzed communications with naval units operating in the Arctic. "Big Jim's" loud voice changes all that.

A. R. Teifeld
Copperweld Steel Company
Glassport, Pa.



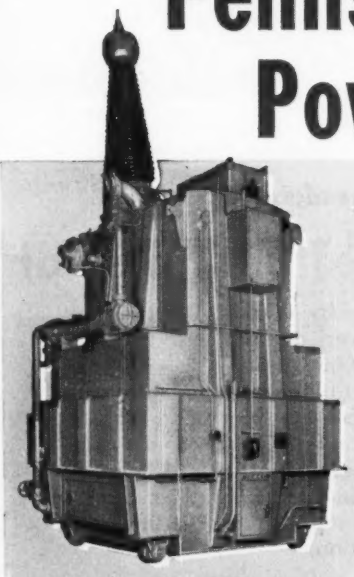


36,000/48,000/60,000 KVA
Auto Transformer. Three-phase, 60 Cycles, 55°C. Rise. 138,000 Grd. Y —115,000 Grd. Y—13,800△ volts.



25,000/33,333/41,667 KVA
Single-phase, 60 Cycles, 55°C. Rise. 110,000—7950/13,800 volts.

Pennsylvania Oil-filled Power Transformers



29,000 KVA
Single-phase, 60-cycles, 55°C. Rise. 230,000 Grd. Y/132,800 —13,200 volts.

According to NEMA Standards, oil-filled transformers can be cooled in nine different ways. The manner of cooling depends upon many considerations, such as the operating characteristics of transformers using various types of cooling; the availability of large quantities of water; and what is very important, the economics of selecting one type of transformer over another.

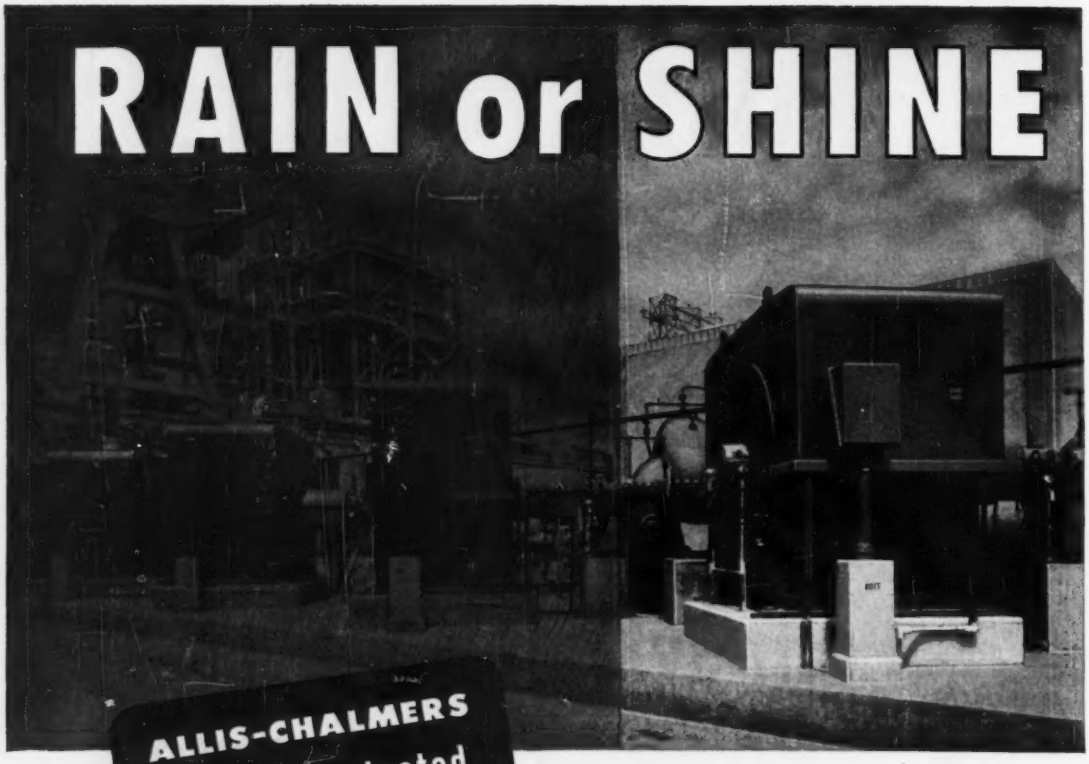
The latter consideration may require some study. Auxiliary cooling methods applied to a self-cooled transformer can add, at relatively low cost, as much as 66⅔% additional capacity to the transformer. On the other hand, the efficiency of the transformer and the cost of operating certain types of cooling equipment may be more important considerations than the initial lower cost of a forced-cooled transformer. These are matters that can best be discussed between the engineers who specify a transformer and the engineers who design the transformer.

Pennsylvania Transformer Company manufactures transformers of every standard classification and with every type of cooling equipment. If you have a problem in cooling, or for that matter, if you have any transformer problem, you are invited to utilize the experience of Pennsylvania's Engineering Department.

Write for free copy of booklet No. 522 entitled "Economics of Transformer Cooling." This booklet explains the various methods of cooling transformers and discusses their advantages and disadvantages.

PENNSYLVANIA TRANSFORMER COMPANY
A McGRAW ELECTRIC COMPANY DIVISION
CANONSBURG, PA. • *Greater Pittsburgh District*

RAIN or SHINE



ALLIS-CHALMERS
Weather-Protected MOTORS

Low-cost outdoor installation plus dependable operation under all weather conditions

Economy plus reliability — regardless of weather conditions — was the combination demanded by Southern California Edison for the circulating water pump motors at the 250,000-kw Etiwanda Steam Station. And that's the combination delivered by the four Allis-Chalmers motors shown above.

Each of these modern weather-protected squirrel-cage motors is rated 900 hp, 4160 volts, 435 rpm. Smaller motors of similar design were supplied by A-C for the station's condensate booster pumps.

Proved by Special Tests

The weather-protected design has been tested under extreme conditions. Running at normal speed and voltage, motors of this type were deluged with water at rates up to 40 inches per hour — driven by winds up to 75 miles per hour. This was done repeatedly from all angles, but on inspection no moisture was detected on the windings. And other tests checked effectiveness in keeping out wind-driven fine sand — a serious threat at this west coast installation.

Movie and Bulletin Available

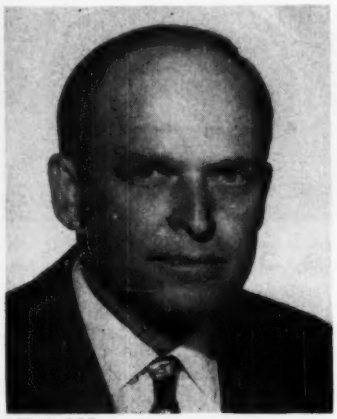
See how A-C test-proved these motors. Ask your A-C representative to show you the 12-minute movie *The Sky is the Roof*. Or write for Bulletin 05B7874. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4176

ALLIS-CHALMERS

Poe Elected a Vice President

Arizona Public Service elevates new executive appointee from managership of its Southern Division



LEE H. POE

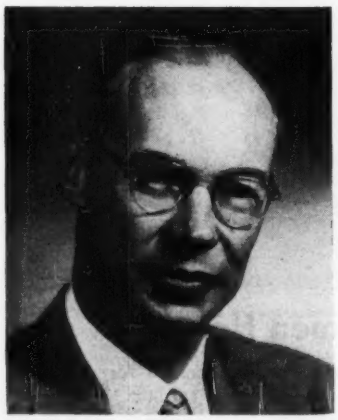
Lee H. Poe has been elected a vice president of Arizona Public Service Co. Since April of this year he has been Southern Division manager, and will continue to be responsible for utility operations in the Yuma, Buckeye, Gila Bend, Casa Grande Valley, and Bisbee-Douglas areas.

Poe, who was graduated from the Georgia School of Technology in 1925, started his career as an electrical engineer with Florida Power & Light Co, where he stayed until 1929. For the next 12 years he worked on power projects in Mexico, South America, and various parts of the United States.

He joined Central Arizona Light & Power Co in 1941 to head the electric distribution section. Calapco was one of the two companies that merged to form Public Service.

From 1942-46 he served in the Army Ordnance Department. He was discharged with the rank of colonel and rejoined Calapco, which in 1947 named him manager of Phoenix District operations.

Howard Crabtree Is Promoted



HOWARD K. CRABTREE

Howard K. Crabtree has been named a vice president of New England Power Co and Connecticut River Power Co with headquarters in the Boston offices of New England Electric System. He formerly was assistant to William R. Bell, vice president of the NEES subsidiaries.

Crabtree, an electrical engineering graduate of Tufts College, started his career with New England Power in 1929 as a technical assistant. In 1935 he was transferred to New England Power Service Co, another NEES subsidiary, as an engineering assistant. Before becoming assistant to the vice president he again served New England Power as an engineer.

•

Robert H. Johnson has been named manager of the industrial sales department of Duquesne Light Co. In other appointments, **Lloyd J. Lingemann** was made manager of the municipal sales department and **J. W. O'Nan** and **John White** were appointed directors of the industrial sales department. Johnson, who joined the utility in 1925, was made director of industrial sales in 1950. Lingemann, who has been with the company since 1919, was named director of municipal sales in 1937.

Maxwell D. Millard, Detroit district manager of sales for the American Steel and Wire Division of United States Steel Corp, has been appointed to the newly created position of assistant general manager of sales. Millard, who started his career with the American Steel and Wire Division in 1934, will serve as assistant to John Graham, general manager of sales at division headquarters in Cleveland.

Melvin B. Monson has been named assistant manager of the new Milwaukee steel service plant of Joseph T. Ryerson & Son, Inc, which will be opened Jan. 1. With Ryerson since 1934, Monson formerly was manager of the work order department of the company's Chicago plant.

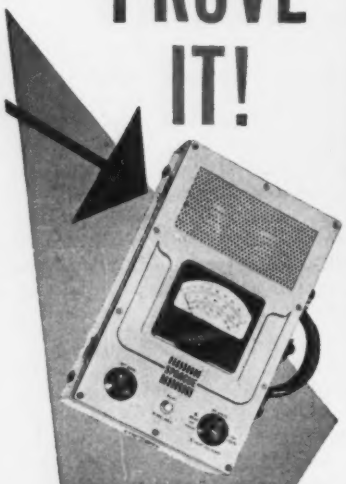
MORRIS H. COOK

Named a Vice President

The appointment of Morris H. Cook as a vice president of New York Bell Telephone Laboratories, Inc., becomes effective Jan. 1. He succeeds William H. Martin who has resigned to become Deputy Assistant Secretary of Defense. In his new post Cook will be in charge of station apparatus and outside plant development, quality assurance, and design engineering.

Customer Wiring Overloaded?

PROVE IT!



...with the Sprague

ADEQUATE WIRING ANALYZER

This compact Sprague instrument easily and quickly checks wiring to see if it's adequate for present or contemplated loads.

Prove to customers the effect of increasing loads on their wiring *right in their own home.* Direct reading meter indicates percentage voltage drop on 115 or 230 volt circuits under load *without troublesome calculations.*

Connectors for convenience outlets, appliances, panel boards, etc., are furnished—ideal for use in home, farm, or plant.

Write for Bulletin PF-600—
Sprague Electric Company,
315 Marshall Street,
North Adams, Massachusetts

SPRAGUE

PIONEERS IN ELECTRIC AND ELECTRONIC DEVELOPMENT

Kuhlman Honors Gakle, 50-Year Man

Wendolyn F. Gakle, vice president and chairman of the operating committee of Kuhlman Electric Co, Bay City, Mich., is shown receiving a pin denoting 50 years' service with the company from Mrs. V. I. Kuhlman, president. Onlookers are George R. Fluehr, secretary and treasurer, and Harlan E. Greenwalt, vice president. At a testimonial luncheon in his honor, Gakle was presented a certificate of meritorious service in tribute to his inventive genius while serving Kuhlman.

AIEE New York Chairmen Honored

Leland Stone, chairman of the New York Section of the American Institute of Electrical Engineers is shown pinning a past chairman pin on H. W. Buck, 80, oldest living past president of the institute, during a recent ceremony at the Engineering Societies Building, New York. Buck was one of 26 electrical engineers in the Metropolitan area honored for service as past chairmen of the New York Section.

Past presidents of the institute who also received pins were Donald F. Quarles, James F. Fairman, and H. P. Charlesworth.

Others in the picture who received pins are (left to right): A. G. Oehler,

H. H. Barnes, M. D. Hooven, Fairman, H. P. Charlesworth, J. D. Tebo, R. T. Oldfield, J. P. Neubauer, C. C. Whipple, George Sutherland, C. R. Jones, A. F. Dixon, C. S. Purnell, J. L. Callahan, D. W. Taylor, J. A. Parrott. H. H. Henline, secretary of AIEE, and Nelson S. Hibshman, assistant secretary, are in the background, right. Other recipents not present were W. J. Barrett, Quarles. C. R. Beardsley, W. R. Smith, T. F. Barton, O. H. Caldwell, R. H. Tapscott, H. A. Kidder, and J. B. Bassett.

Monsanto Elevates Cole; Names 6 Vice Presidents

Monsanto Chemical Co, St. Louis, has announced the appointment of an executive vice president, four division general managers as vice presidents and two regional vice presidents. All appointments are effective Jan. 1.

R. R. Cole, a vice president since 1941 and a director since 1944, was elected executive vice president.

Division general managers appointed vice presidents are: Roy L. Brandenburger, Merchandising Division; Edward A. O'Neal, Jr., Overseas Division; Robert K. Mueller, Plastics Division; and Charles H. Sommer, Jr., Organic Chemicals Division.

Regional vice presidents named are Edward W. Gamble, Jr., Washington, D. C., and Victor E. Williams, New York.

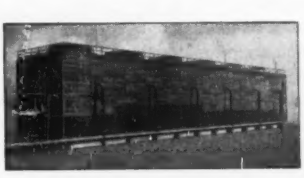
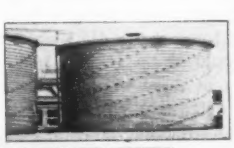
Monsanto Chemical also formally transferred the following five engineering employees to the Atomic Electric Project: George B. Boon, Albert J. Anderson, Lester O. Hoffman, Robert C. Peskorse, and Melvin J. Kornfeld.

OBITUARY

Ambrose M. Cook, 45, superintendent of substation for Indianapolis Power & Light Co since 1943, died Dec. 6. He joined the utility in 1929.

Chester I. Hall, 65, a retired General Electric Co engineer, died recently at Boston, Mass. Hall was serving as consulting engineer to GE's industry control department when he retired last February after 24 years' service. At that time he held 139 patents, largest number for an active employee.

MOST ENGINEERS have long discovered the practicability of *wood* for many industrial installations. And each day, more engineers come to depend on SANTA FE, one of America's most complete facilities for the design and manufacture of industrial wood products. As specialists in wood engineering, SANTA FE can provide assistance on your most complex problem. Write today!

COOLING TOWERS • WOOD TANKS
WOOD PIPE • CROSS ARMS

AND OTHER ENGINEERED INDUSTRIAL WOOD PRODUCTS

SANTA FE TANK & TOWER CO.

5401 South Boyle Avenue, Los Angeles 58, California

BRANCH OFFICES IN ALL MAJOR CITIES

SINCE 1903

Outlook Bright . . .

. . . for 1954 sales, according to year-end statements made by GE, Westinghouse officials

General Electric Co and Westinghouse Electric Corp have predicted that 1954 will be a "good year." The GE prediction was voiced by its president, Ralph J. Cordiner, at a recent conference in New York City. Westinghouse's forecast was made by Pres Gwilym A. Price in a company year-end statement issued in Pittsburgh.

GE's sales are expected to remain about unchanged in 1954 at approximately over $3 billion, according to Pres Cordiner. Sales of Westinghouse during 1954 are expected to exceed 1953's anticipated record $1.6 billion. Sales of General Electric last year were $2.6 billion and Westinghouse's sales in 1952 were $1.4 billion, $200 million less than this year's.

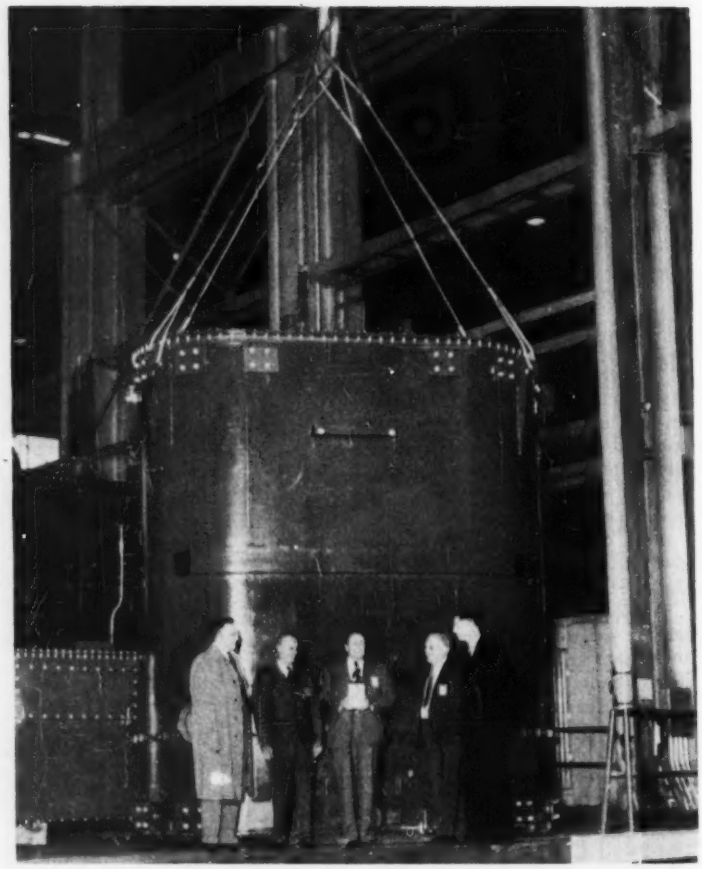
Heavy Equipment Sales . . . As for sales of heavy electrical equipment, Westinghouse is expected to maintain 1954 sales of this business at 1953 rates, Price asserted. Despite concern over foreign competition in the U. S. for heavy electrical apparatus such as turbines, generators, and transformers, Cordiner predicted GE's heavy apparatus business would be at least as big next year as in 1953.

In commenting further on foreign competition, Cordiner mentioned that General Electric recently lost out to a British concern on an order for a waterwheel generator slated for installation in the Pacific Northwest. Cordiner said, "They underbid us because of cheaper labor costs."

Cordiner forecast that GE's civilian business would be up at least 5% in 1954, but that there would be some decline in defense work due to the government's stretchout policies. Price predicted that Westinghouse's shipments of defense products are expected to increase in 1954, as many contracts progress from the development to the manufacturing stage.

Price noted that "increased use of electricity plus the high level of consumer purchasing power point to a strong demand for electrical appliances and other products for the home." He said Westinghouse plans to improve its sales in this field with additional manufacturing capacity, broadened lines of products such as home air conditioning and new traffic appliances, and expanded distribution facilities.

'Year of Decision' . . . In the field of atomic energy, Price said 1953 was "a year of decision" for Westinghouse. The Atomic Energy Commission announced last October that it had assigned to Westinghouse the task of developing the first large-scale industrial power reactor. This paved the way for the first civilian atomic plant.



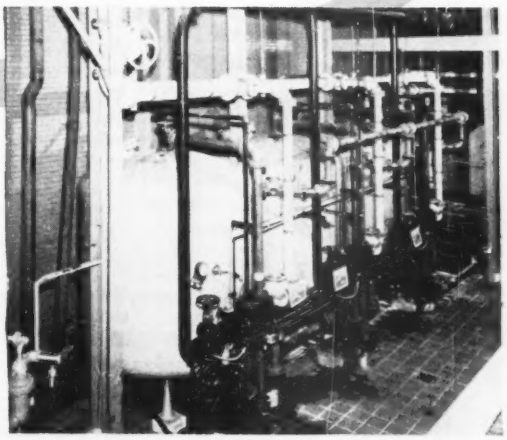
GE Unit Produced in Record Time

About 1,000 employees at General Electric Co's Pittsfield, Mass., plant recently broke all company records by producing a 75-ton, 20,000-kva transformer in 51 days for Louisville Gas & Electric Co. Normal manufacturing time is about 52 weeks. The transformer was needed by Louisville G&E to replace one destroyed in a blast last September at its East Louisville, Ky., substation.

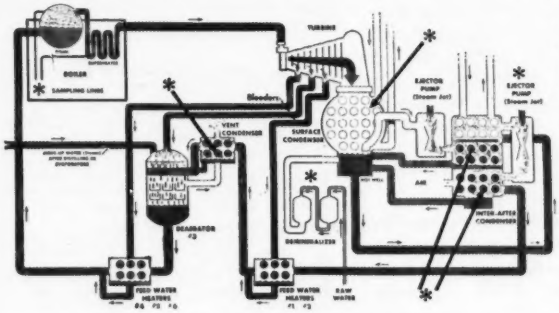
On hand for completion of the unit were (left to right) F. C. McClintock, manager of materials, GE's power transformer department; F. R. Tomlinson, GE service engineer at Cleveland; A. G. Rosenbaum, general superintendent of Louisville G&E; R. C. Whitten, manager of GE's Louisville sales office; and W. B. Gaither, GE transformer specialist, Cincinnati, Ohio.

Call on *Carpenter* for . . .

Cost-Saving
Corrosion Control
*All around your Plants**



Demineralizer lines are only one of several spots in modern steam-electric plants where Carpenter Stainless Pipe and Tubing are helping to solve corrosion problems. Used in places such as are indicated on the diagram below—sampling lines, vent condensers, inter and after condensers, evactors, surface condensers, as well as in water conditioning equipment —they are providing trouble-saving and cost-cutting control of corrosion. Helping industries to solve corrosion problems is a 26-year-old story with Carpenter. In addition to providing optimum corrosion-resistance under any service condition, Carpenter Tubing and Pipe help to cut corrosion control costs in other ways. Their exceptionally uniform wall thickness, ductility, and unvarying piece-to-piece quality assure trouble-free fabrication and time-saving fitting and rolling in . . . less down-time when retubing is necessary. In short, there is a difference in stainless tubing and pipe and Carpenter makes it. It's a difference that's measurable in adherence to rigid standards of analysis, dimensions, finish, tolerance, concentricity and ductility.



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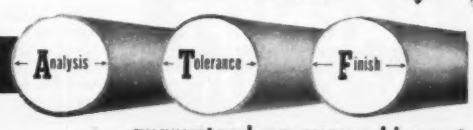

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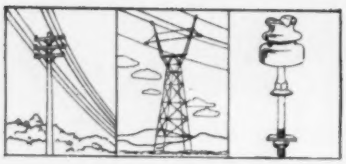
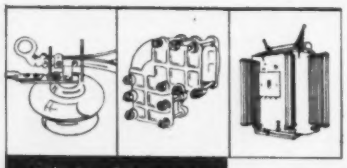


Keep Nuts Tight
on all bolted assemblies



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Refined Copper Stocks Increase in November

Stocks of refined copper held in the United States by members of the Copper Institute, Inc, at the end of November amounted to 93,274 tons, an increase of 8,971 tons above the 84,303 tons held on Oct. 31.

During November deliveries to domestic fabricators dropped to 100,908 tons compared with deliveries of 110,519 in October. Refined production also dropped to 119,230 tons from 126,138.

Outside the United States refined stocks totaled 261,096 tons on Nov. 30, an increase of 2,415 tons above the 258,681 tons on Oct. 31. November deliveries increased to 80,009 tons from 70,258 tons in October and refined production dropped to 79,009 tons compared with 92,632.

MANUFACTURING BRIEFS

Hubbard & Co's Pittsburgh plant has resumed normal operations after a six-weeks' strike by its production workers.

As part of a ten-year program, British Thomson-Houston Co, Ltd, Rugby, England, plans to construct a new factory at Larne, Northern Ireland, for the expansion of its turbine business. The new factory, which will concentrate on the manufacture of turbo-generators of 30,000 kw and more, will be built next to the turbine blading factory now being constructed by the government of Northern Ireland.

Reliance Electric & Engineering Co, Cleveland, will soon start construction of a 90,000-sq ft addition to its Ashtabula, Ohio, plant. When completed the project will employ about 400 workers.

SALES ASSIGNMENTS

COMPANY STAFFS

Line Material Co, Milwaukee, Wis., has appointed three new field engineers in its North Central Division. John R. Botts has been assigned the southern Minnesota area handled by Tom D. Williams, who now covers central Minnesota and eastern Wisconsin. Botts and Williams will make their headquarters at Minneapolis. Wilbur R. Collin handles the western Minnesota and eastern North Dakota territory out of the Fergus Falls, Minn. office. He replaces Gordon J. Griffith, recently transferred to L-M's Milwaukee office. Gerald O. Smith will cover western North and South Dakota, eastern Montana, and northeastern Wyoming from L-M's newly established office at Bismarck, N. D.

National Electric Products Corp, Pittsburgh, has named Jack C. Maeder district sales manager for its Cleveland district. Maeder, who joined National Electric in 1931, comes to Cleveland from Detroit, where he was assistant district manager of the company's western Michigan district.

MEETINGS CALENDAR

National Rural Electric Cooperative Association
Annual Meeting of Members, Dinner Key Auditorium, Miami, Fla., Jan. 11-14.

Doble Client Conference
Sponsored by Doble Engineering Co., Sheraton Plaza Hotel, Boston, Jan. 11-15.

Public Information Program
Mid-Atlantic Region Meeting, Atlantic City, N. J., Jan. 15; West North Central Region Meeting, Madison, Wis., Feb. 5.

Edison Electric Institute
Accident Prevention Committee, Hotel Statler, Boston, Jan. 18-19; Industrial Relations Committee, Joint Meeting with Personnel Administration Section, Southeastern Electric Exchange and Southwestern Personnel Group, Hotel Roosevelt, New Orleans, La., Jan. 21-22; EEI-AGA Taxation Accounting Committee, Arlington Hotel, Hot Springs, Ark., Jan. 27-29; Transmission and Distribution Committee, Hotel Cleveland, Cleveland, Ohio, Feb. 9-10; Electrical Equipment Committee, Sheraton Cadillac Hotel, Detroit, Mich., Feb. 15-16; Industrial Relations Committee, EEI Headquarters, New York, March 18; Sales Meeting, Edgewater Beach Hotel, Chicago, April 5-8; EEI-AGA Accounting Conference, Hotel Statler, Boston, April 12-14; Industrial Relations Committee, Netherlands Plaza Hotel, Cincinnati, Ohio, April 15; Annual Meeting, Atlantic City, N. J., June 1-4.

American Institute of Electrical Engineers
Winter General Meeting, Statler Hotel, New York, Jan. 18-22; Conference on Feedback Control, Claridge Hotel, Atlantic City, N. J., April 22-23; Northeastern District Meeting, Schenectady, N. Y., May 5-7; Conference on Telemetering, Morrison Hotel, Chicago, May 24-26; Summer General and Pacific General Meeting, Hotel Biltmore, Los Angeles, June 21-25.

Canadian Electrical Association
Eastern Zone Meeting, Chateau Frontenac, Quebec, Que., Jan. 18-22; Western Zone Meeting, Royal Alexandria, Winnipeg, Man., March 1-3; Annual Convention, Murray Bay, Quebec, Que., June 24-26.

Industrial Electrification Council
National Industrial Electric Heating Conference, Netherlands Plaza Hotel, Cincinnati, Ohio, Jan. 18-22.

New England Meter Engineers
Hotel Somerset, Boston, Jan. 21-22; Demand Register School, New England Power Bldg., Boston, Feb. 8-13.

Instrument Society of America
9th Annual Regional Conference, Hotel Statler, New York, Feb. 4.

Missouri Valley Electric Association
Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 4-5; Engineering Conference, President Hotel, Kansas City, Mo., April 7-9.

Electrical Equipment Representatives Association
Winter 1954 Meeting, Biltmore Hotel, Los Angeles, Feb. 8-11.

Western Computer Conference-Exhibit
Sponsored jointly by American Institute of Electrical Engineers, Institute of Radio Engineers, and Association for Computing Machines Computer Conference Committee, Ambassador Hotel, Los Angeles, Feb. 11-12.

Pennsylvania Electric Association
Winter Meeting, Transmission-Distribution Committee, Lord Baltimore Hotel, Baltimore, Feb. 11-12; Winter Meeting, Relay Committee, Benjamin Franklin Hotel, Philadelphia, March 4-5.

Public Utilities Advertising Association
Region 5 Meeting, Atlanta, Ga., Feb. 11-12; Region 1 Meeting, Montreal, Mount Royal Hotel, Que., Feb. 25-26; National Convention, Hotel Statler, Boston, May 13-14.

National Association of Purchasing Agents
Mid-Winter Conference, Public Utility Buyers' Group, Lord Baltimore Hotel, Baltimore, Md., Feb. 15-16.

***National Adequate Wiring Bureau**
10th Annual Adequate Wiring Conference, La Salle Hotel, Chicago, Feb. 25-26.

Southern Safety Conference-Exposition
Kentucky Hotel, Louisville, Ky., March 7-9.

National Electrical Manufacturers Association
Spring Meeting, Edgewater Beach Hotel, Chicago, March 8-11.

National Association of Corrosion Engineers
10th Annual Conference and Exhibition, Kansas City, Mo., March 15-19.

Southeastern Electric Exchange
21st Annual Meeting, Boca Raton Hotel, Boca Raton, Fla., March 22-24; Spring Meeting, Engineering and Operation Section, Sans Souci Hotel, Miami Beach, Fla., May 6-7.

American Power Conference
Sherman Hotel, Chicago, March 24-26.

Oklahoma Utilities Association
Annual Convention, Biltmore Hotel, Oklahoma City, March 25-26.

Northwest Public Power Association
Annual Convention, Winthrop Hotel, Tacoma, Wash., March 31-April 1-2.

Pacific Coast Electrical Association
Administration Services Section, Hotel Claremont, Berkeley, Calif., April 7-8; Annual Convention, Hotel Del Coronado, Coronado, Calif., May 19-21.

Illuminating Engineering Society
Southern Regional Conference, Roosevelt Hotel, New Orleans, La., April 8-9; Southwestern Regional Conference, Rice Hotel, Houston, Tex., April 11-14; Inter-Mountain Regional Conference, Denver, Colo., April 15-16; South Pacific Coast Regional Meeting, Museum of Art, San Francisco, April 19-20; Canadian Regional Meeting, King Edward Hotel, Toronto, Ont., April 28-30; Great Lakes Regional Meeting, Sheraton Cadillac Hotel, Detroit, May 3-4; Midwestern Regional Meeting, Hotel Jefferson, St. Louis, June 17-19.

American Welding Society
National Spring Technical Meeting, Hotel Statler, Buffalo, N. Y., May 4-7.

CIGRE
International Conferences on Large Electric High-Tension Systems, Paris, France, May 12-22.

Electrical Women's Round Table
1st Annual National Conference, Sheraton Hotel, St. Louis, May 14-15.

National Association of Electrical Distributors
Annual Convention, Atlantic City, N. J., June 6-11.

American Society of Mechanical Engineers
Semi-Annual Meeting, William Penn Hotel, Pittsburgh, June 20-24.

Michigan Electrical Association
Annual Convention, Grand Hotel, Mackinac Island, Mich., June 27-30.

*Addition this week.

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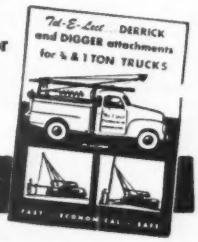

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French Agency Pushes Plans for Tidal Plant

PARIS — (McGraw-Hill World News)—Electricite de France is pushing its preliminary planning for a big tidal power plant to be located at the estuary of the Rance river in Brittany.

Plans call for construction of a dam 725 meters long between Saint Malo and Dinard at the mouth of the river. Average head would be five to six meters, and a basin of 20 square kilometers would be formed.

The power plant would be composed of 26 groups each with a Kaplan turbine of 14,000 horsepower and a triphased alternator of 8,500 kva supplying energy under 10 kv. Output would be 700 million kwhr a year.

Average tide at the mouth of the Rance is 38 ft. At mid-tide, the flow is 15,000 cubic meters per second, a volume 300 times greater than that of the Rhone River at the big Genissiat dam.

The project has not yet received final approval. Cost is estimated at $150 million, and funds will have to be made available by an appropriation of the National Assembly.

Interior Not Endeavoring to Sell CVP, says Tudor

"Interior Department is not endeavoring to sell the Central Valley Project to the State of California," said Undersecretary Ralph A. Tudor at a press conference in San Francisco, Dec. 15. However, he added this doesn't mean Interior has shut the door to any purchase plan that will return to the federal government a sum not less than that which it would receive should ownership of the vast $365 million multipurpose project be retained. And Tudor pointed out that any transfer of CVP should not preclude the future possibility of federal projects in California.

Any sale of CVP will be based on the reimbursable features of the project, he said. Worth of these features has been estimated by the California Water Project Authority at about $295 million. Cost of non-reimbursable items like flood control, navigation, etc, will be absorbed by the federal government, explained Tudor.

Tax Law Changes

(*Continued from page* 72)

to comment on their chances in Congress next year.

Proposal which would exempt a small amount of corporation stock dividends from individual income taxes would affect all investor-owned corporations, and not merely electric companies. For that reason it is believed to have a pretty good chance of acceptance.

Federal Income Taxes Higher . . . Oakes pointed out in testimony before the committee that federal corporation income tax is taking an increasingly larger share of earnings, leaving less dividends for the investor. When an individual income tax is then levied on the dividend, it shrinks still further.

The proposal would exempt from individual income taxes the first $200 received in corporation dividends. Alternative amounts suggested for exemption were $500, 5% or 10% of the corporation dividends received by an individual taxpayer.

This, said Oakes, would be aimed at attracting investors to corporate financing by removing a small portion of the double federal taxation on corporation earnings. On the $200 exemption, Oakes estimated the government would lose no more than $250 million in revenue. This might be made up, he said, by an increased equity ratio in corporate financing.

Proposal to levy a tax of around 13% on power revenues of tax-exempt bodies would be an attempt toward equalizing federal tax contributions of all electric utilities. Oakes did not specifically recommend that rural electric co-ops be subject to the tax, but did point out that generating and transmission co-operatives are rapidly moving into the power business.

Tax-Exempt Status . . . Oakes charged that state and municipal bodies are taking advantage of their tax-exempt status to supplant taxpaying electric companies. In the past two decades, he said, a total of 43 electric companies have been taken over by the Tennessee Valley Authority and the various state agencies. Another 72 companies have been taken over in whole or in part by rural electric co-op projects promoted and financed by the federal government.

The proposed 13% figure is less than the amount presently paid by

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- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLAN BULLETIN OR HOUSE MAGAZINE?
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NATIONAL BLOOD PROGRAM

privately owned electric companies on total revenues from customers. Oakes presented charts showing that federal taxes for 1952 took $13.98 out of every hundred dollars received from electric company customers. Federal tax cut for 1953, he said, is expected to be around $14.30.

More Dollars for Federal Treasury . . . The EEI spokesman estimated that the tax levy would bring an additional $121.5 million into the federal treasury annually. Of this, approximately $75.9 million would come from municipalities, $34.8 million from federal agencies, and $10.8 million from non-federal authorities.

In addition, Oakes proposed that federal taxes be levied on bonds issued by public bodies for "proprietary functions." This would include bonds sold in connection with public power operations.

American Public Power Association, which represents some 700 local public power groups, has commented that taxing federal power operations is a "rather ridiculous notion" and would amount to taking money out of one pocket and putting it in the other. As for taxing power revenues of state and municipalities, APPA argues there are "strong constitutional grounds against taxation of one level of government by another."

New Upper Peninsula Generating Firm Formed

Additional electric power facilities for Michigan's Upper Peninsula have been approved under a series of orders issued by the Michigan Public Service Commission.

The Upper Peninsula Generating Co, a new corporation, will construct a 22,000-kw generating plant at Marquette. The new corporation was authorized to issue $6.9 million in bonds and common stock. It will serve the Upper Peninsula Power Co and the Cleveland-Cliffs Iron Co.

Upper Peninsula Power Co has received approval to purchase the properties of Michigan Gas & Electric Co and the Cliffs Power & Light Co in Alger, Schoolcraft, and Marquette counties.

Upper Peninsula Power Co has been authorized to issue $2,905,000 in bonds and stocks to help finance these purchases. PSC said there will be no change in consumer electric rates.

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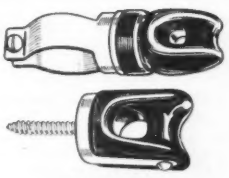

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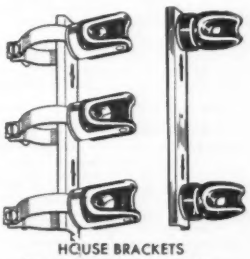

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SENIORS—Experienced public utility electrical design, transmission and distribution engineers required by an established consulting organization for work on continued program of plant expansion, transmission and distribution planning and betterment work for public utility operating companies located in eleven Latin American countries. Headquarters New York; possibly some travel. Preferred age range 30-45. Attractive salaries. Excellent opportunities for qualified men. Reply stating age, education, experience and personal particulars.

P-1018E, Electrical World
330 W. 42 St. New York 36, N. Y.

WANTED: ENGINEER with Electric Power Distribution Experience

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P-9962 Electrical World,
330 W. 42 St., New York 36, N. Y.

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JUNIORS—Graduate electrical engineers for station design, transmission and distribution work required by an established consulting organization for work on continued program of plant expansion, transmission and distribution planning and betterment work for public utility operating companies located in eleven Latin American countries. Headquarters New York—possibly some travel. Preferred age under 30. Experience 0-5 years. Salary commensurate with qualifications. Splendid opportunities for right men. Reply stating age, education, experience and personal particulars.

P-1019, Electrical World
330 W. 42 St. New York 36, N. Y.

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WANTED: ELECTRICAL Engineer for Office and Field Work. Central Illinois Public Service Co., Springfield, Illinois. Att.: Electrical Engineer.

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U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4094) will be received at Denver, Colorado, until January 21, 1954, for furnishing one (1) 230-kv (900-kv BIL), 1,200-ampere, 5,000,000-kva IC, 3-cycle interrupting, 15- to 40-cycle reclosing, power circuit breaker, for Jamestown Substation, Transmission Division, North Dakota, Missouri River Basin Project. Delivery is desired within 420 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

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1—	750	G.E.	Condensing—265 lbs., 440-3-60 Built 1944
1—	500	Moore	Non-Cond—150/200 lbs., 5/35 lbs. B.P., 480-3-60 Dir. Conn. Exciter.
1—	300	G.E.	Non-Cond—150/175 lbs., 5/10 lbs. B.P., 480-3-60
1—	200	Whse.	Non-Cond. 125/150# 18P 5/10# B.P., 240/480 v-3-60

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Qu.	Kva	Make	Cycles	Voltages
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1—	3750	G.E.	25/60	4150/2400 x 2400/4150
1—	3125	G.E.	25/60	4150/2400 x 2400/4150
2—	2500	G.E.	25/62½	2300 x 4160
1—	1250	G.E.	25/58.3	4400 x 2300
1—	625	A.C.	25/60	11000 x 2300

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3 ph, 60 cy.

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2—	2000		G.E.	450	250 2400
2—	2000		G.E.	514	600 6600/13200
1—	2000		G.E.	500	665 25 cy. 11000
2—	1750		G.E.	514	250 2400
1—	1500		C.W.	514	115 4000/13800
1—	1500		G.E.	720	600 13200
1—	1000		G.E.	900	260 4100/6900
2—	1000		Whse.	900	600 2300/4150
1—	750		Whse.	900	275 2300/4150
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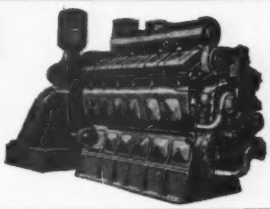

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1100	General Motors	16-278A	1600	720	200	General Motors	8-268A	330	900
750	General Motors	12-567	1000	720	150	Worthington	CC-4	225	450
500	Baldwin	VO-8	750	514	150	Ingersoll-Rand	S-4	225	900
500	General Motors	6-278A	750	720	150	Buckeye	40	240	900
500	General Motors	8-567	720	720	100	Worthington	BB-5	150	900
480	Worthington	DD-8	700	360	100	General Motors	2-268A	150	1200
400	Ingersoll-Rand	S-8	900	720	60	General Motors	6-71	90	1200
350	Baldwin	VO-6	510	450	30	Internat'l Harvester	UD-14	45	1200

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3— 333 KVA Whse., 1 Ph., 2400V. 600 V. sec.
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1— 100 KW G.E., 250V. 900 RPM, 2300V. Syn.

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NEW "SEARCHLIGHT" ADVERTISEMENTS received by 10:00 A.M. Dec. 30th will appear in the Jan. 11th issue subject to space limitations.
Classified Advertising Division
ELECTRICAL WORLD
330 W. 42nd St., New York 36, N. Y.

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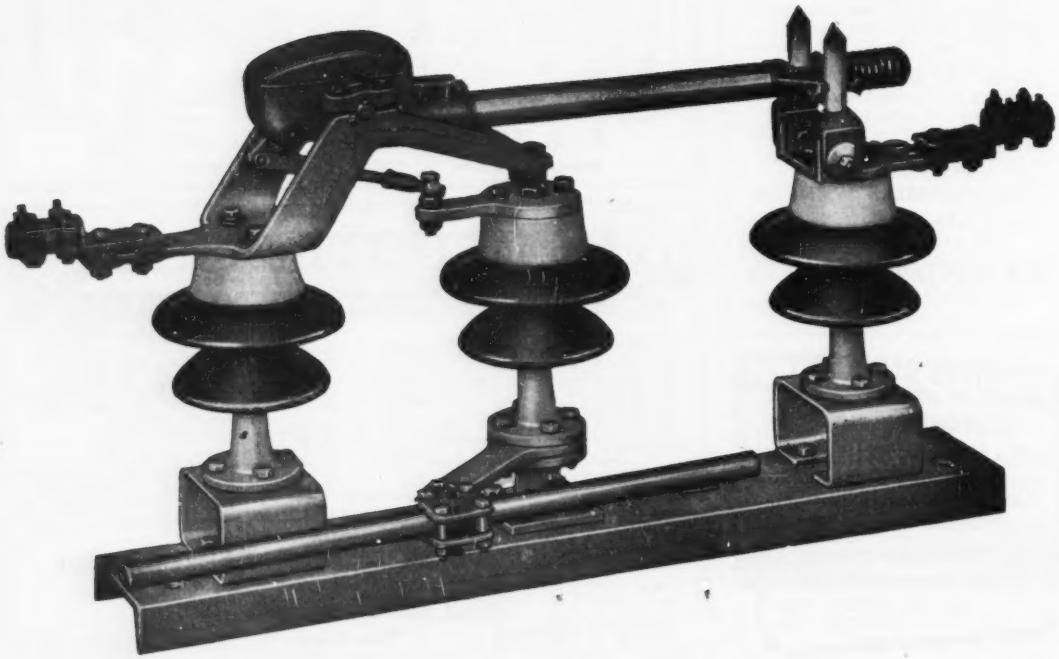
Tests made in our laboratory under severe icing conditions show the switch illustrated below, closed (left) and after opening (right). Ice was over 1" thick: Only 450 inch pounds were required to open switch.



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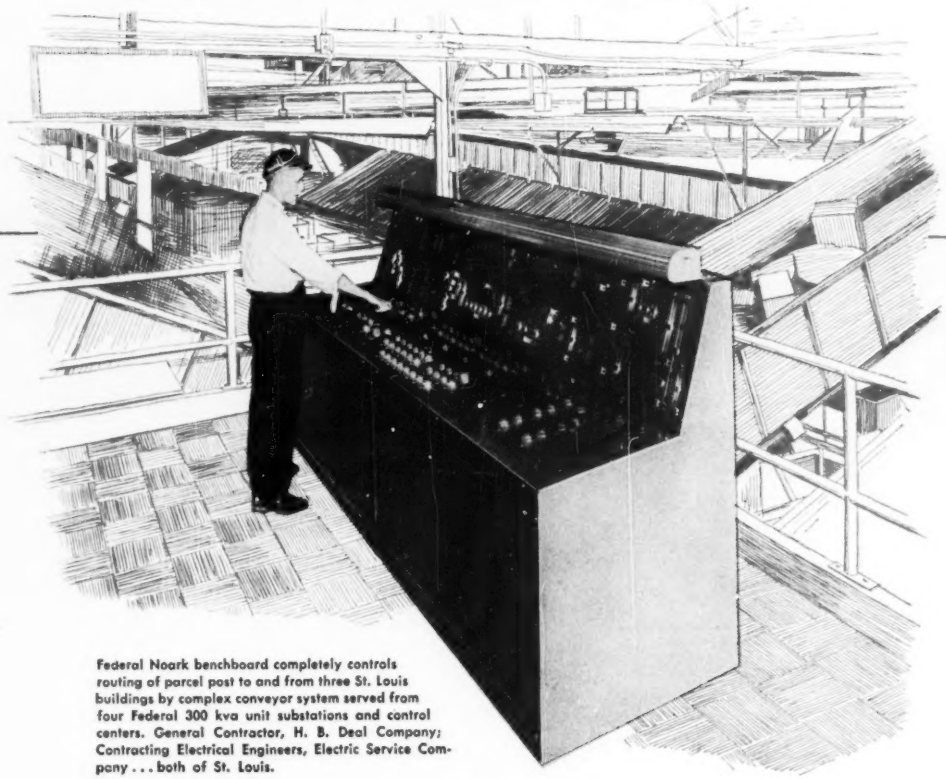

Federal Noark benchboard completely controls routing of parcel post to and from three St. Louis buildings by complex conveyor system served from four Federal 300 kva unit substations and control centers. General Contractor, H. B. Deal Company; Contracting Electrical Engineers, Electric Service Company . . . both of St. Louis.

PARCEL POST in St. Louis is now rapidly moved by the Terminal Railroad Association's new conveyor system from Union Station, a new Terminal building, and the Post Office. This system, the most elaborate of its kind in the country, is powered from four Federal Noark Unit Substations and controlled by a specially-designed Federal Noark indicating bench board.

The unit substations are 300 kva, 4180/480 volt, 3-phase. Each has a three-position fused primary selector switch so that either of two primary sources can be selected. Each station has a main secondary breaker feeding a close-coupled control center. Secondaries from all units can be tied together through Federal Noark Bus Duct.

The benchboard completely outlines the entire system and can select any number of conveyor arrangements which are instantly indicated by illuminated routings shown in miniature.

Here is another example of Federal's ability to handle your distribution or control problems. Remember, Federal Noark has the engineering skill and manufacturing facilities to provide exactly the right equipment for your requirements.

Federal Electric Products Company
50 Paris Street, Newark 5, New Jersey

Federal Noark products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct — **Pacific Electric Manufacturing Corporation products:** High voltage circuit breakers and power switches ★ Sales offices in principal cities.

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OCT 19 1954

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of leadership in the electrical industry

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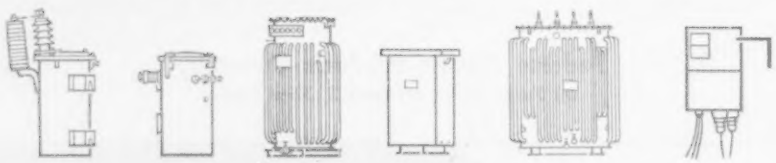
IN *the beginning, when the carbon arc light was first being used for street lighting, Kuhlman Electric developed a series street lighting transformer while engineers were proclaiming that it couldn't be done. Continuing to pioneer, Kuhlman was the first to take advantage of the better qualities of cold rolled oriented steel by developing the Bent Iron Core. This development precipitated a revolution in transformer design, and today most manufacturers utilize this steel to produce lighter, smaller, and more efficient transformers.*

KUHLMAN, *through the years, has introduced advanced design and new techniques to the art of transformer manufacturing. When fabrication by means of gas and electric welding was introduced by the metal industry, Kuhlman was one of the first to use welded transformer tanks and also first to use porcelain enameling paint on tanks for highly corrosive atmospheres. To insure safety and ease when installing pole-mounted transformers, Kuhlman engineers developed the knob type high-voltage bushing, which makes it possible to connect the transformer to the line without the use of tools. These accomplishments are illustrative of the many contributions that Kuhlman has made to the progress of the electrical industry, and have built for Kuhlman a reputation for progressive thinking and quality manufacturing.*

TODAY, *through constant research and ever expanding facilities, Kuhlman Electric Company continues its pioneering leadership in the electrical industry. For, although Kuhlman is now sixty years old, it has never lost the indomitable spirit and youthful vigor with which it began its rise to the position among the leaders that it holds today.*



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